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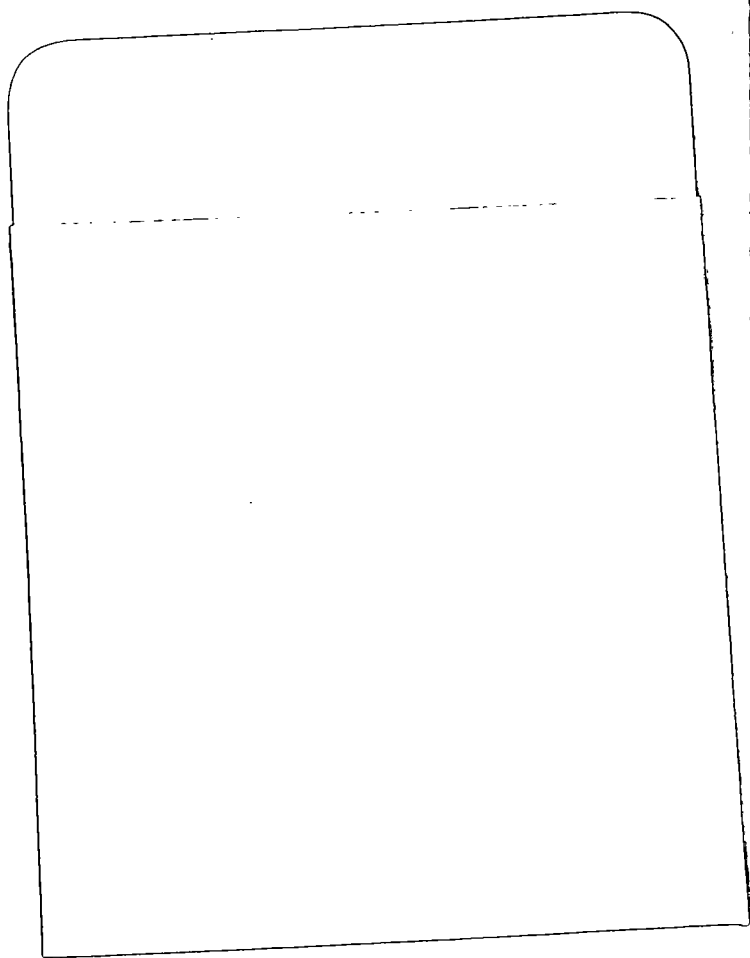
DEPARTMENT OF THE ARMY FIELD MANUAL

75-MM PACK HOWITZER M1A1

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HEADQUARTERS, DEPARTMENT OF THE ARMY
AUGUST 1962



FIELD MANUAL

No. 6-78

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., 10 August 1962

75-MM PACK HOWITZER M1A1

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CHAPTER 1

GENERAL

1. Purpose and Scope

a. This manual is a guide to assist commanders, and chiefs of sections in developing the sections of 75-mm pack howitzer firing batteries into teams that will operate effectively in battle. This manual includes individual duties in section drill, firing, and preparation for traveling to include helicopter transporting, inspection and maintenance drills, tests and adjustments for sighting and fire control equipment, and methods for the destruction and decontamination of equipment. The material presented herein is applicable without modification to both nuclear and nonnuclear warfare.

b. Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded direct to U.S. Army Artillery and Missile School, Fort Sill, Okla.

2. Definitions and Terms

a. Cannon. A weapon, larger than small arms that throws its projectile by the use of an explosive. This includes guns, howitzers, and mortars.

b. Gun. A cannon above .30 caliber (length 30 times the diameter of the bore) with a low angle of fire and a high muzzle velocity.

c. *Howitzer*. A cannon with a medium length barrel, a high angle of fire, and a medium muzzle velocity (fig. 1).

d. *Service of the Piece*. Operation and maintenance of a weapon or other equipment by its crew.

e. *Section*. In this manual, the term "section" is used to designate *only* the personnel required to serve one weapon and the equipment prescribed by a table of organization and equipment (TOE).

f. *Piece*. In this manual, the term "piece" applies to the howitzer being operated by the section; e.g., TO THE REAR OF THE PIECE, FALL IN.

g. *Coupled*. A piece is coupled when it is attached to its prime mover and all braking and lighting connections are in place.

h. *Uncoupled*. A piece is uncoupled when it is detached from its prime mover.

i. *Front*. For the purposes of conducting drills prescribed herein, the front, howitzer coupled, is the direction in which the prime mover is headed; howitzer uncoupled, it is the direction in which the muzzle points. For determining the left or right of the howitzer *itself*, coupled or uncoupled, the front is the direction in which the muzzle points.

j. *Right (Left)*. The right (left) of one facing to the front.

k. *In Battery*. A tube (barrel) in battery is a gun tube fully returned on its cradle from recoil.

3. References

Publications applicable to the 75-mm pack howitzer, towed are listed in appendix I.

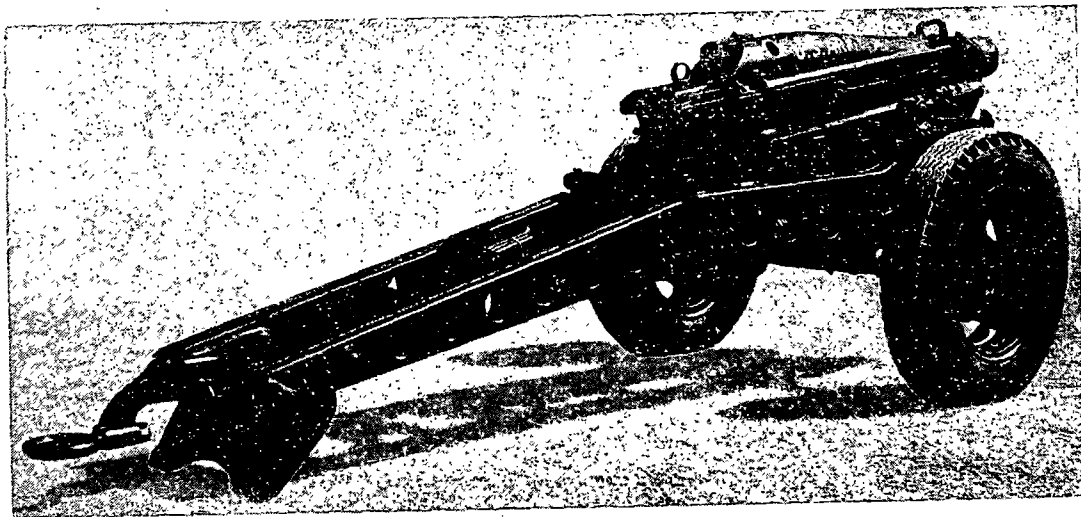


Figure 1. The 75-mm pack howitzer

CHAPTER 2

ORGANIZATION

4. Composition of the Section

- a. The howitzer section consists of—
 - (1) A chief of section (CS)
 - (2) A gunner (G)
 - (3) An assistant gunner (1)
 - (4) Four cannoneers, numbered 2 to 5. No. 1 is the assistant gunner as shown in (3) above.
 - (5) A prime mover driver (D)
- b. Section equipment. (fig. 2)

Figure 2. Section equipment 75-mm pack howitzer.

(Located in back of manual)

5. General Duties of Personnel

a. *Chief of Section.* The chief of section (CS) is the commander of the section. He is responsible for—

- (1) The proper training of personnel.
- (2) The efficiency of the section.
- (3) The duties listed under section drill, duties in firing, testing and adjustment of sighting and fire control equipment, and inspection and maintenance of all section equipment, especially the howitzer with its prime mover.
- (4) Safety.
- (5) Preparation of field fortification for protection of personnel, equipment and ammunition.
- (6) Camouflage discipline and chemical, biological, and radiological defense discipline.
- (7) Maintenance of the equipment logbooks.
- (8) Improvement and policing of the section area.

b. Gunner. The gunner assists the chief of section in the duties outlined in *a* above. Specific duties are outlined in later chapters.

c. Cannoneers. Cannoneers perform duties listed in later chapters and other duties outlined by the chief of section.

d. Driver. The driver's primary duties are driving and maintaining the prime mover. He remains with the prime mover unless assigned other duties. He should be trained in the fundamentals of section drill so that he will be able to work as a cannoneer when required.

CHAPTER 3

SECTION DRILL

SECTION I. GENERAL

6. Objective

The objective of section drill is efficiency: maximum precision coupled with high speed.

7. Instructions

a. Except for commands and reports, section drill should be conducted in silence. The section must be drilled until reactions to commands are rapid and automatic. To achieve the objective stated in paragraph 6 and to prevent personal injury and equipment damage, the drills prescribed in this manual must be followed.

b. Members of the section must be impressed with the importance of reporting promptly to the chief of section any errors discovered either before or after the command to fire has been given. The errors are then corrected and reported to the battery executive immediately.

c. The battery executive, or his representative, should supervise the drill to insure uniformity and efficiency.

d. During each training period, duties should be rotated so each man can perform all the duties within the section. All personnel within the battery not assigned specific duties during drill periods, should be trained in the fundamentals of section drill to become capable of functioning with a section if required.

Section II. PRELIMINARY COMMANDS AND FORMATIONS

8. Forming the Section

a. *To Fall In.* The chief of section takes his post. On the command FALL IN, the section forms in a single rank, at close interval, centered on the chief of section at a distance of 3 paces. The gunner is always at the right and the driver at the left of the rank. The numbered cannoneers fall in numerical sequence from right to left. The chief of section may indicate in his preparatory command the place and direction most suitable to form the section for a particular situation. At the first formation for a drill or exercise, the caution, "As a section," precedes the command. The commands may be FALL IN; or 1. IN FRONT (REAR) OF YOUR PIECE, 2. FALL IN. Cannoneers face the direction of fire unless told otherwise; 1. ON THE ROAD FACING THE PARK, 2. FALL IN; or 1. ON THE LEFT (RIGHT) OF THE PIECE, 2. FALL IN. Cannoneers face the piece unless told otherwise.

Note. On any of the commands, the section moves at double time and forms at close interval, at attention, guiding on the gunner.

b. *To Call Off.* With the section in formation (fig. 3), at the command CALL OFF, all personnel except

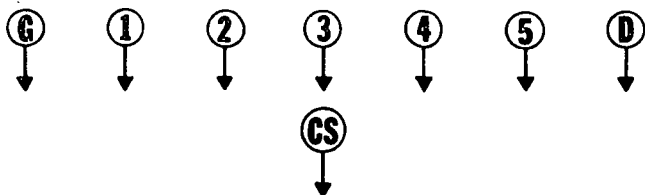


Figure 3. Section in formation.

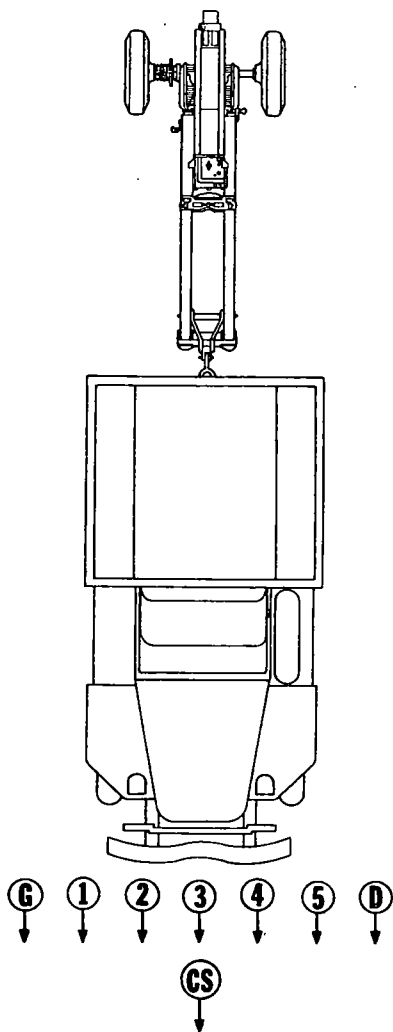


Figure 4. Section formed in front of the piece, coupled.

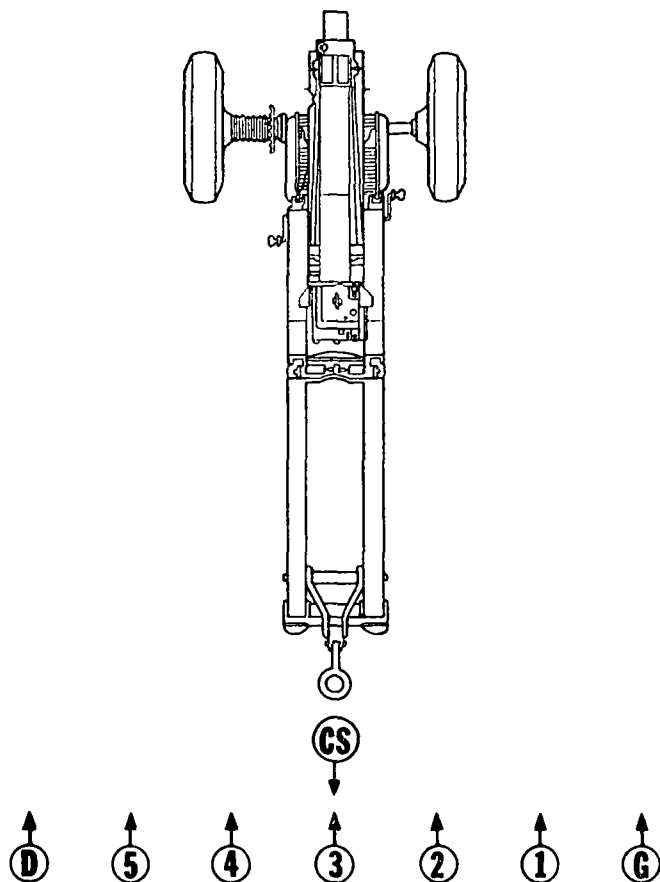


Figure 5. Section formed in rear of the piece, uncoupled.

the gunner execute eyes right. The section then sounds off in sequence: "gunner," "1," "2," "3," "4," "5," "driver." As each man calls out his designation, he turns his head smartly to the front.

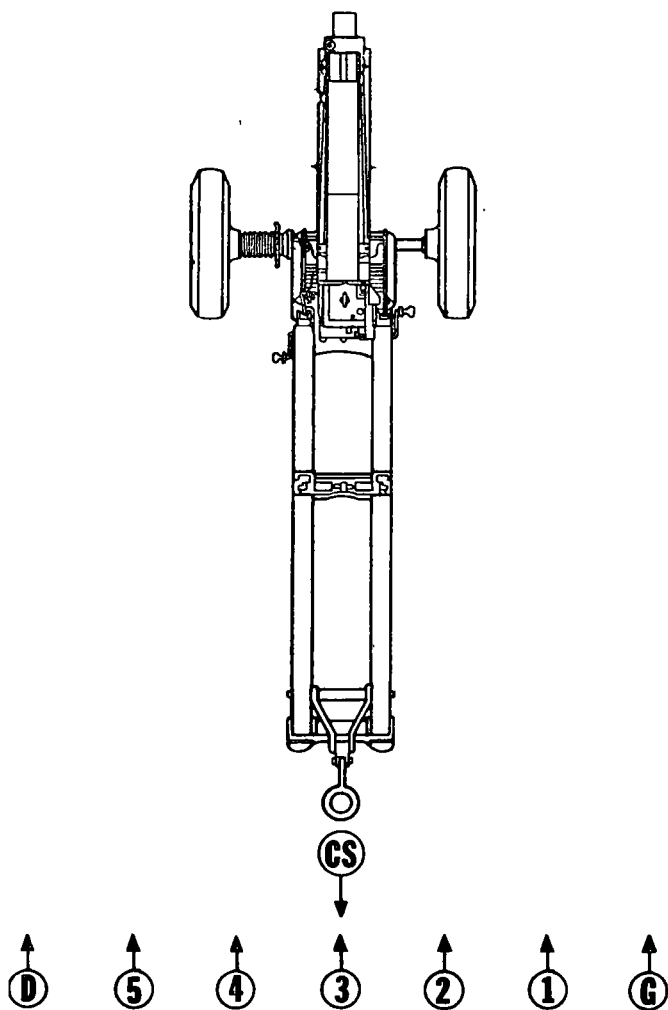


Figure 6. Section formed in rear of the piece, uncoupled, prepared for action.

9. Posts

The command is 1. CANNONEERS, 2. POSTS. The command is general and is applicable whether the section is in or out of ranks, at halt, or marching. The command is executed at double time and terminated at the position of attention.

a. Piece Coupled. The section moves to posts shown in figure 7. ALL personnel face the front and are alined 2 feet outside the prime mover, gunner and even-numbered cannoneers on the right, odd numbers on the left. Numbers 4 and 5 even with the rear of the prime mover. The gunner and remaining cannoneers cover on them, in order, at normal interval. The driver and chief of section are even with the front bumper on the left and right sides respectively.

b. Piece Uncoupled, March Ordered. The section moves to posts shown in figure 8. All personnel face the front and are alined 2 feet outside the wheels. The gunner is even with the hub of the left wheel, and the even-numbered cannoneers are covered on him at a normal interval. The number 1 man is even with the hub of the right wheel and the odd-numbered cannoneers are covered on him at a normal interval. The chief of section positions himself where he can best control the section.

c. Piece Prepared for Action. The section moves to posts as shown in figure 9, with all personnel facing the front, except the chief of section, who faces the executive officer unless the section is drilling independently. Gunner and No. 1 are 1 foot in the rear of the left and right wheels, respectively. No. 2 stands 2 feet in rear of the gunner, covering him. Nos. 3, 4, and 5, from right to left, 2 yards to the left and on line with the spade.

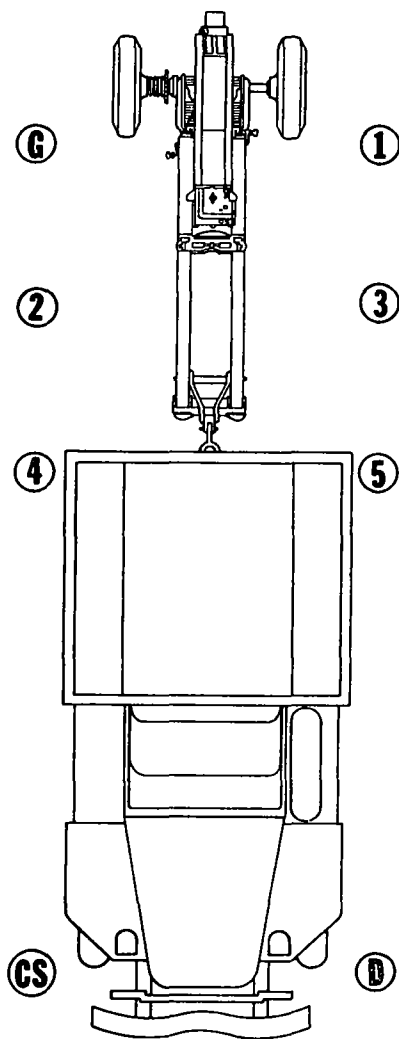


Figure 7. Posts, coupled.

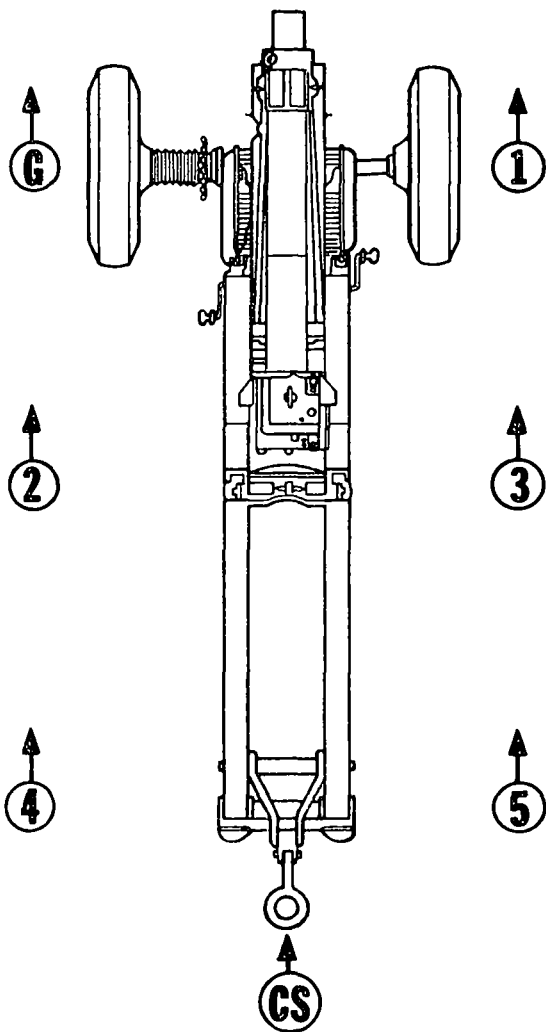


Figure 8. Posts, uncoupled, march ordered.

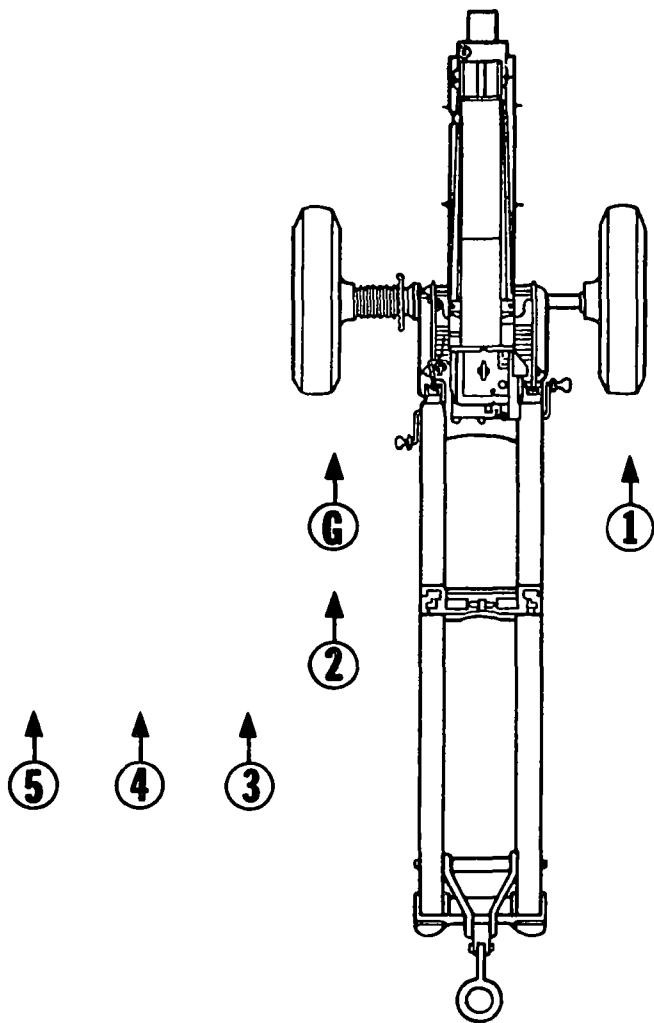


Figure 9. Posts, uncoupled, prepare for action.

10. To Change Posts

a. To acquaint the members of the section with all the duties and to lend variety to drill, posts should be changed frequently. With the section *in formation*, the commands are 1. CANNONEERS, CHANGE POSTS, 2. MARCH. 1. SECTION, CHANGE POSTS, 2. MARCH.

b. At the command CANNONEERS, CHANGE POSTS, MARCH, only the numbered cannonneers change posts. On the preparatory command, No. 5 takes one step to the rear and executes a right face. On the command of execution, he moves at double time in rear of the section to the post of No. 1. All numbered cannonneers take two left steps, placing them at the post of the next higher numbered cannonneer.

c. At the preparatory command SECTION, CHANGE POSTS, the driver (or leftmost man) takes one step to the rear and executes a right face. On the command of execution he moves at double time in rear of the section to the gunner's post. The gunner and all other men in line take two left steps as in *b* above.

11. To Mount

a. The commands are 1. PREPARE TO MOUNT, 2. MOUNT; or MOUNT.

b. At the preparatory command in *a* above, the section moves at a double time to positions shown in figure 7. At the command of execution, all members of the section mount and take seats as shown in figure 10. Before the commander of the vehicle and the driver mount, they verify that the howitzer is properly coupled, that personnel and equipment are aboard, and that the tailgate and safety strap are secure. If any members of the section are to remain dismounted, their designation is announced with the caution "stand

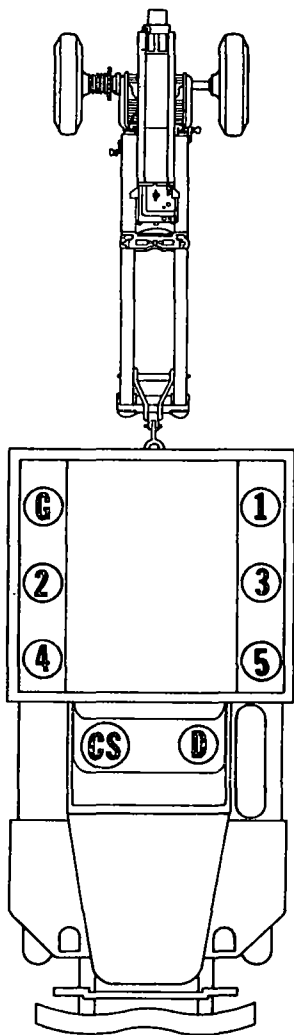


Figure 10. Posts, coupled, mounted in prime mover.

fast" between the preparatory command and the command of execution; e.g., 1. PREPARE TO MOUNT, DRIVER STAND FAST, 2. MOUNT.

c. When a truck, $\frac{1}{4}$ ton, is used as a prime mover, at the preparatory command the driver, chief of section, gunner and No. 1 move at a double time to positions on the ground convenient for mounting the truck. At the command of execution they mount in an expeditious manner. The other cannoncers are formed as directed by the first sergeant and are either transported or marched to their destination.

d. If the command is MOUNT, the section executes without pausing, all that has been prescribed in *b* or *c* above.

12. To Dismount

a. The commands are 1. PREPARE TO DISMOUNT, 2. DISMOUNT; or DISMOUNT.

b. At the preparatory command in *a* above, the members of the section stand, if appropriate, and make preparations to dismount quickly. At the command of execution, members of the section jump to the ground and take posts as shown in figure 7.

c. If the command is DISMOUNT, the section executes without pausing all that has been prescribed in *b* above.

13. To Fall Out

a. *At Drill.* When it is desired to give the section a rest from drill or relieve them temporarily from a *formation* or *post*, the command FALL OUT is given. The command may be given at any time and infers that the section is to remain in the vicinity of the drill area.

b. *When Firing.* When firing has been suspended temporarily, but it is desired to have the section remain in the vicinity of the piece, the command **FALL OUT** is given. The section stands clear of the piece to insure that settings and layings remain undisturbed. During these periods, the chief of section may direct his men to improve the position, to replenish ammunition, or to do other necessary work around the howitzer.

CHAPTER 4

PREPARING THE HOWITZER FOR FIRING AND TRAVELING

Section I. PREPARATIONS FOR FIRING

14. To Uncouple

The command is **UNCOUPLE**. At the command, members of the section take positions shown in figure 11 and execute the following:

a. The gunner disconnects the blackout light system from the prime mover. No. 2 removes the blackout light system from the piece and places it in the section chest.

b. The gunner and No. 1 support the right and left sides of the trail, respectively as they face the pintle. No. 3 unlatches the pintle.

c. The gunner and No. 1 raise the trail and No. 3 folds the lunette forward or removes it depending on type of lunette used.

d. The gunner and No. 1, assisted by Nos. 2 and 3, move the piece to the desired location.

e. Equipment and ammunition is unloaded and arranged in an orderly manner.

f. The section personnel take their posts as shown in figure 9.

15. Direction

a. *Action Front*. If the command **ACTION FRONT** is given, the howitzer is turned in a clockwise direction (par. 2i).

b. *Action Right (Left)*. The command is **ACTION RIGHT (LEFT)**. The movement is executed as in

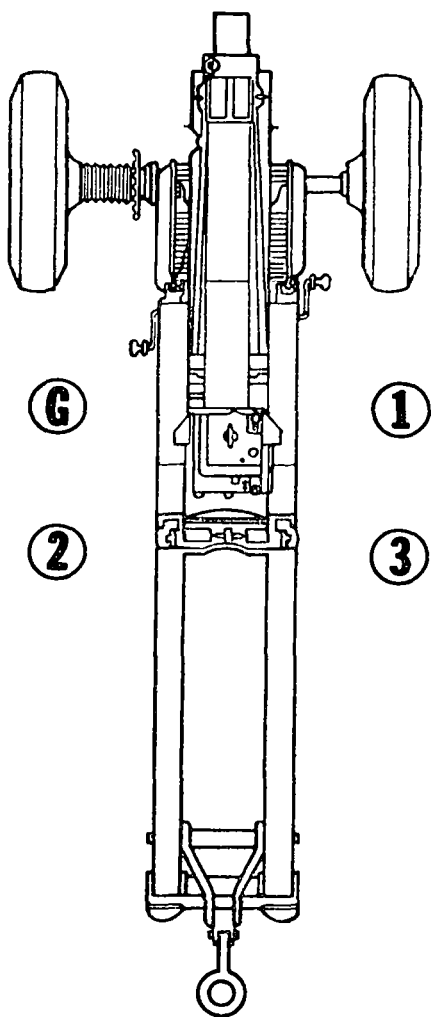


Figure 11. Uncoupling (coupling) the piece.

ACTION FRONT, except after the piece is uncoupled, it is turned 90° in the appropriate direction (par. 2j).

16. Moving the Piece by Hand

a. On the commands 1. PIECE FORWARD (BACKWARD), 2. MARCH, the following actions are taken:

(1) The gunner and No. 2 grasp the left side of the trail.

(2) No. 1 and No. 3 grasp the right side of the trail.

b. At the command MARCH, all move the howitzer forward (backward) under the direction of the chief of section.

c. At the command HALT, the piece is stopped and the cannoneers take their posts (par. 9c and fig. 8).

17. Prepare for Action

a. With the howitzer in position uncoupled, the command PREPARE FOR ACTION, is given. If the command is not given by the battery executive before the weapon moves into position, it is habitually given by the chief of section as the piece is uncoupled.

b. Individual duties in the execution of the command are shown in table I. On completing the designated duties personnel take posts (fig. 9).

c. The caution DO NOT PREPARE FOR ACTION must be given if the weapon is only to be uncoupled.

Section II. PREPARATIONS FOR TRAVELING

18. March Order

a. To prepare to travel, with the howitzer uncoupled and prepared for action, the command is MARCH

ORDER. After completion of designated duties, personnel take posts as shown in figure 8.

b. Individual duties during march order are shown in table II.

19. To Couple

With the piece in position, march ordered, the command is COUPLE. The prime mover is positioned by the chief of section. The duties are as follows:

a. The section directed by the chief of section loads tools, ammunition, and equipment.

b. Nos. 3 and 4 raise the trail.

c. No. 5 folds the lunette down into position, or attaches the lunette, depending on the type used.

d. The chief of section causes the prime mover to be backed until the lunette can be placed on the pintle.

e. No. 5 latches the pintle.

f. Nos. 1 and 2 assist with the wheels if necessary.

g. No. 1 secures the blackout light system to the muzzle; the gunner connects the cable to the prime mover.

h. As each man completes his duties, he takes his post (fig. 7).

i. The chief of section verifies that the section is in order; checking that the blackout lighting system is connected, the pintle latched and locked and all equipment loaded. He then reports, "Number () in order."

20. Special Operations

For procedures involving aircraft delivery, parachute delivery, and animal transport of the 75-mm pack howitzer, refer to TM 9-319. Helicopter external loading procedures are referenced in FM 1-100.

Table I. Duties in Prepare for Action.
(Located in back of manual)

Table II. Duties in March Order.
(Located in back of manual)

CHAPTER 5

DUTIES IN FIRING

Section I. INDIRECT LAYING

21. Duties of Individuals

The general instruction given in paragraphs 6 and 7 on the conduct of section drill apply equally to section drill during firing. The specific duties during firing are outlined in paragraphs 22 through 28. General duties are as follows:

a. The chief of section is responsible that all duties are performed, all commands executed, and all safety precautions observed.

b. The gunner sets the site, deflection, and elevation announced, and lays and refers the piece.

c. No. 1 opens and closes the breech and fires the piece.

d. No. 2 loads the piece.

e. No. 3 operates the fuze setter and sets fuzes.

f. No. 4 holds rounds for No. 3 to set fuzes, passes rounds to No. 2 for loading, and assists No. 5 in preparing charges.

g. No. 5 prepares ammunition and charges for firing and shifts the trail.

22. Chief of Section

For indirect laying, the duties are as follows:

a. *Lays for Elevation When Gunners Quadrant Is Used.*

- (1) The command USE GUNNER'S QUADRANT indicates that the gunner's quadrant

is to be used because the range quadrant is inoperative or does not provide the accuracy desired for the mission being fired.

- (2) A QUADRANT 361.8, for example, is set on the gunners quadrant as follows:

The upper edge of the index plate is set opposite the 360 mark of the graduated arc on the quadrant frame and the micrometer on the index arm is turned to read 1.8. Care must be taken to use the same side of the quadrant in setting both the index plate and the micrometer knob.

- (3) The announced quadrant having been set on the gunner's quadrant, the piece loaded and the breechblock closed, the gunner's quadrant is set on the quadrant seat leveling plates on top of the breech. The words "line of fire" must be at the bottom of the quadrant with the arrow pointing toward the muzzle. The chief of section must be sure to use the arrow which appears on the same side of the quadrant as the scale which he is using. He stands squarely opposite the side of the quadrant and holds it firmly on the quadrant seat leveling plates parallel to the axis of the bore. It is important that he take the same position and hold the quadrant in the same manner for each case he will view the quadrant bubble from the same angle.
- (4) The chief of section then directs the gunner to elevate or depress the piece until the bubble is centered, being careful that the last motion is in the direction of depression. The chief of section cautions the gunner when the

bubble is approaching the center, in order that the final centering may be accurate.

- (5) Normally, special and calibration corrections will be added algebraically at the battery fire direction center and simply announced as No. (), QUADRANT ().

b. Measures the Quadrant. At the command MEASURE THE QUADRANT, with the piece laid, the chief of section directs the gunner to center the cross-level bubble, to insure the angle of site scale is set at 300, and, with the elevation knob, center the range quadrant longitudinal-level bubble. The chief of section reads the quadrant set on the range quadrant scales and announces it as "No. () quadrant ()." If the range quadrant is inoperative or known to be inaccurate, the quadrant is measured by placing the gunner's quadrant on the leveling plate on the breech ring where the chief of section, by raising and lowering the index arm and turning the micrometer knob, centers the bubble. He then reports the reading on the gunner's quadrant to the executive.

c. Measures Site to the Mask.

- (1) The command is MEASURE THE SITE TO MASK. The chief of section directs the gunner to insure that 300 is set on the angle of site scale and center the cross-level bubble. Then, sighting along the lowest element of the bore, he directs the gunner to traverse and No. 1 to operate the elevating mechanism until the line of sight along the lowest element of the bore just clears the crest at its highest point in the probable field of fire. He then directs the gunner to center the longitudinal-level and cross-level bubbles by turning

the range quadrant knob. The chief of section reads the site to the mask from the range quadrant scales and reports to the executive, "No. (), SITE (), RANGE (meters)."

- (2) When the executive announces the minimum quadrant elevation, the chief of section records it in a notebook and causes the gunner to chalk it on the trail flask.

d. Indicates the Aiming Point to Gunner. When the executive designates an aiming point, the chief of section will make sure he has properly identified the point and indicate it to the gunner. If necessary, the chief of section will place the horizontal and vertical hairlines of the panoramic telescope on the designated point.

e. Follows Fire Commands. The chief of section will follow fire commands and will repeat the commands if required.

f. Indicates When the Piece is Ready to Fire. As soon as the gunner calls, "Ready," the chief of section will extend his right arm vertically, and report orally to the executive, "Number () ready."

g. Gives the Command to Fire. The chief of section will drop his right arm sharply to his side and command FIRE. He requires the personnel to stand clear of the piece until it is firmly seated.

h. Reports Mistakes and Incidents in Firing to the Executive. If for any reason a weapon cannot fire, the chief of section reports this to the executive, "No. (), misfire." When it is discovered that a round has been fired in error, the chief of section will report it; an example is "No. () fired 40 mils right." If the gunner reports that the aiming posts are out of alinement, the

chief of section reports this and requests permission to realine them. Any incident that affects the service of the piece is reported.

i. Conducts Prearranged Fires. When prearranged fires are ordered the chief of section will fire his section to conform with prescribed data.

j. Records Basic Data. The chief of section records semipermanent data such as minimum quadrant; aiming points used and their deflections; prearranged fires when section data sheets are not furnished; deflection and quadrant safety limits; date, hour, and number of rounds fired; calibration and individual piece corrections when appropriate.

k. Observes and Checks Functioning of Materiel. Before the piece is fired, the chief of section assures that a proper amount of recoil oil is in the recoil mechanism, and carefully observes the functioning of the recoil system. He promptly reports to the executive any evidence of malfunctioning (TM 9-319).

l. Assigns Duties When Firing With Reduced Strength. When firing is conducted with the section reduced in numbers below that prescribed in this manual, the chief of section will make redistribution of duties to best facilitate service of the piece.

m. Verifies the Adjustment of the Sighting and Fire Control Equipment. Paragraphs 179 and 180, TM 9-319 give detailed description of tests and adjustments.

n. Checks All Rounds Prepared for Firing Before They are Replaced in Their Container. Insures that all four powder increments are present in proper numerical order, condition, and lot number. Secs that lot numbers on ammunition and container correspond.

23. Gunner

The duties of the gunner are as follows:

a. Centers the Level Bubbles on the Telescope. The centering is a part of all operations that involve the use of the panoramic telescope M1 or the elbow telescope M62. Centering the bubbles and leveling the telescope mount is always done prior to firing.

b. Lays the Piece for Direction. The executive commands BATTERY ADJUST, AIMING POINT THIS INSTRUMENT. The gunner identifies the aiming point through the panoramic sight and announces NUMBER () AIMING POINT IDENTIFIED. The executive then commands NUMBER () DEFLECTION (). The gunner sets the announced deflection on the panoramic sight by disengaging the throwout lever and rotating the head of the sight until the approximate 100-mil graduation is opposite the index. The remainder of the announced deflection is set on the azimuth micrometer scale. The gunner commands MUZZLE RIGHT (LEFT) to aline the line of sight with the aiming point. No. 5 at the trail assisted, if necessary, by Nos. 1 and 2 at the wheels, shifts the trail as indicated by the gunner until the vertical line of sight is approximately on the aiming point. The gunner then completes the laying by operating the traversing handwheel until the vertical line of sight is accurately on the aiming point. The gunner must also insure that the longitudinal and cross-level bubbles are centered. The gunner then announces NUMBER () READY FOR RECHECK. As additional deflections are announced, the gunner sets them off as described above. When the executive commands NUMBER ()

IS LAID, the gunner will not disturb the lay of the tube until an aiming point is fixed.

c. Alines Aiming Posts. With the piece laid, as in *b* above, unit standing operating procedure will specify the deflection at which aiming posts will be placed upon completion of laying. The gunner will direct No. 5 with hand signals in the alinement of the aiming posts with the vertical reticle of the sight.

d. Sets or Changes a Deflection. The command is DEFLECTION (). If, for example, the command is DEFLECTION 1885, the gunner disengages the throwout lever with his right hand and with his left hand turns the rotating head of the sight to 18(1800). He releases the throwout lever and with his left hand turns off the remaining 85 mils on the micrometer scale. He then alines the vertical reticle on the aiming post as in *b* above. The last motion is such as to cause the vertical hair of the telescope to approach the aiming point from the left to take up any lost motion in the mechanism.

e. Applies Individual Piece Correction for Deflection. The command is ON NO. (), OPEN (CLOSE) (so much). The gunner of the piece indicated in the command does not change the deflection indicated on his sight. Each of the other gunners changes his sight setting in the following manner. The gunner *next* in line to the piece indicated in the command will change his sight setting by that amount indicated in the command; the gunner of the *third* piece in line by *two* times this number; the gunner of the *fourth* piece in line by *three* times this number and so on in sequence until all pieces have opened or closed on the designated piece. For example if the command is ON NO. 1 OPEN 5 the gunner of No. 1 makes no change. The

gunner on No. 2 turning the top of the azimuth worm knob toward himself sets on 5 mils; the gunner on No. 3 turning the top of the azimuth worm knob in a similar manner sets off 10 mils; and the gunner of No. 4 also turning the top of the azimuth worm knob in a similar manner sets off 15 mils. The executive may announce individual deflections to each piece which include the individual piece corrections. The correction will be applied until the mission is completed.

f. Refers the Piece. The command from the executive is AIMING POINT THIS INSTRUMENT (or other point), REFER without disturbing the lay of the piece, the gunner turns only the sight until, with bubbles level, the vertical reticle is on the point designated. He then reports the deflection to the executive: "No. (), deflection ()."

g. Makes Correction for Aiming Post Displacement. See paragraph 42.

h. Insures that the Angle of Site Scale is set at 300. The gunner turns the micrometer drum until the index is opposite 300 on the angle of site scale, and 0 is indicated on micrometer scale.

i. Sets and Lays for Quadrant. The gunner turns the elevation knob until the announced quadrant is indicated on the elevation scale, and the micrometer index. The gunner then turns the elevating crank with his right hand until the bubble of the angle of site level is centered. When centering the bubble, the eye should be directly opposite the bubble, and in the same relative position for each laying. In all cases of laying for quadrant the last movement of the elevating crank must be in the direction of depression, so as to raise the breech, thereby taking up any lost motion in the elevation mechanism.

j. *Calls "Ready."* The piece having been laid for direction and elevation, the cross-level bubble centered, and the piece loaded and ready to fire, the gunner verifies the laying, moves his head clear of the sight, and calls "Ready" to indicate the piece is ready to be fired.

24. Number 1

The No. 1 cannoneer is the assistant gunner (par. 4a(3)). A detailed list of his duties follow.

a. *Opens and Closes the Breech.*

(1) *Opens breech.* No. 1 grasps the operating lever with his right hand and compresses the lever latch. He rotates the lever to the right, sliding the breechblock to the right.

(2) *Closes the breech.* No. 1 grasps the operating lever with his right hand, rotates the lever to the left, sliding the breechblock to the left. When the round is pushed home by No. 2, it causes a slight jar as the round strikes the extractor which No. 1 can feel through the operating handle. This is the instant to close the breech.

b. *Calls "Set."* When No. 1 closes the breech, he calls, "Set."

c. *Fires the Piece.* At the command and signal FIRE from the chief of section, No. 1 pulls the lanyard sharply to the rear and slightly downward, and quickly releases it. *Under no circumstances will No. 1 grasp the lanyard until the gunner calls, "Ready."* In case of a misfire, instructions contained in paragraph 46 should be followed.

d. *Uses the Rammer.* The rammer is used to extract unfired rounds or cartridge cases which cannot be

ejected by the extractor. The sponge and rammer will be handled by No. 1 only. For detailed instruction see TM 9-319.

25. Number 2

The duties of the No. 2 cannoneer are as follows:

a. Loads the Howitzer. To load the piece, No. 2 stands 2 feet in rear of the gunner on the left side of the trail. No. 2 receives the round from No. 4 and grasps the base of the cartridge case with his right hand and in rear of the ogive with his left hand. After quadrant is announced, he inserts the round in the breech, removes his left hand, and pushes the round home with his right *fist*. If the round is pushed home with the fingers there is great danger of crushing fingers when the breechblock is closed. Care should be exercised to avoid striking the fuze against any part of the piece, and keeping rounds to be loaded out of the path of recoil.

b. Calls Out the Round Number and Quadrant in Volley Fire. To insure firing the correct number of rounds, No. 2 calls out the number of the round and the quadrant as he loads the projectile. On the last round he adds, "Last round." For example, when three rounds are to be fired at quadrant 350 he calls out, "Third and last round, 350." He calls out only loud enough for his section to hear.

c. Inspects the Chamber and Bore. After each round is fired, No. 2 inspects to see that the chamber and bore are free of any residue from the charge. He calls "Bore clear", only loud enough for his section to hear.

d. Dispenses With Empty Cartridge Cases. No. 2 stacks empty cartridge cases to the left rear of the piece where they will be out of the way of the section.

26. Number 3

The duties of No. 3 cannoneer are as follows:

a. Fuzes or Changes Fuzes of Projectiles. No. 3 removes the fuze or closing plug from the projectile; removes (or replaces) the supplemental charge, if necessary; and screws in the designated fuze. In fuzing or defuzing the shell, only the authorized fuze wrench should be used. VT fuzes should be screwed in by hand and tightened with fuze wrench M18 using only manual force.

Caution: Do not hammer on the wrench or use an extension handle. If a time fuze is used, No. 3 removes the safety pullwire from the fuze.

b. Sets the Fuze Using Setter M26 or M28.

- (1) Fuze setter M26 may be used with TSQM54, TSQM55, MT67, TSQM500, TSQM501, and TSQM520 fuzes. No. 3 seats fuze setter M26 on the fuze by inserting the upper lug in the upper recess. He loosens the wingnut on the setter; and sets the announced time on the appropriate time band. He locks the wingnut, places the handle in the horizontal position, and turns counterclockwise (in the direction of increasing reading) until he feels a stop and hears a click. He then raises the handle to the vertical position, removes setter, and verifies the setting by visual inspection.
- (2) Fuze setter M28 (only) should be used to set fuze VT M513-series. No. 3 places the stationary lug on the setter into the top recess of the fuze and pushes down until the setter is fully seated on the fuze. No. 3 sets the fuze by placing the announced setting on

the fuze setter and turning clockwise until the setter stops or a click is heard. He should then remove the setter and make a visual check of the fuze setting.

c. Sets Other Fuzes.

- (1) When FUZE QUICK is announced, No. 3 will verify the superquick setting. (The slot on the setting sleeve should be alined with the letters SQ). When FUZE DELAY is announced, he will turn the setting sleeve with a screwdriver until the slot is alined with the word DELAY.
- (2) Combination time and superquick fuzes will detonate on impact if the time element fails. For impact action the command is FUZE M500 (or other fuze) QUICK. For a superquick action No. 3 verifies that the S on the time ring is alined with the index; if not, he alines them.

d. Uses Fuze Setter M27. This is a wrench-type fuze setter in which the fuze time scale is used in setting the fuze. No. 3 engages the setter in the notch on the setting ring of the fuze rotates the ring in the direction of increasing readings until the announced time setting is opposite the index mark on the fuze. The type of setter should be used only when mechanical setters are not available.

Caution: A time fuze should not be set more than twice, and should be returned to ordnance if not fired after two settings.

27: Number 4

The duties of No. 4 cannoneer are as follows:

a. Removes Ammunition from Boxes. No. 4 removes

several rounds from their boxes and arranges them in a convenient manner for firing.

b. Assists No. 3 in Setting Fuzes. See paragraphs 26*a* through *d* for details.

c. Passes the Round to No. 2. No. 4 passes the round to No. 2 with his left hand under the cartridge case and his right hand under the projectile, so that No. 2 can grasp the base of the projectile with his right hand. No. 4 must insure that the projectile and cartridge case do not separate.

d. Assists No. 5 in Preparing Charges. See paragraph 28*c* for details.

28. Number 5

The duties of the No. 5 cannoneer are as follows:

a. Sets Out and Assists the Gunner in Aiming the Aiming Posts. See paragraph 23*c*.

b. Removes Ammunition from Containers. No. 5 removes the rounds from their containers and inspects the rounds to see that they are free of sand and dirt and that the rotating band is not burred. The rounds are wiped with a cloth, and any burred rounds are placed aside until the burrs are removed with a file.

c. Prepares Charges. When the designation of the charge is given in the fire command, No. 5 verifies the number of increments and removes those higher numbered increments. He then replaces the remaining charges in the cartridge case in their original numerical order. After preparing the charge, he fits the projectile to the cartridge case.

d. Shifts Trail. At the command MUZZLE RIGHT (LEFT), No. 5 grasps the trail handspike and shifts the trail in the desired direction. When necessary he is assisted by No. 4, who grasps the rear trail flask,

and Nos. 1 and 2, who man the right and left wheels respectively. The trail is shifted until the vertical reticle is approximately on the aiming point. The gunner commands DOWN.

e. Replaces Increments in Cartridge Cases Prior to Replacing Rounds in Containers. Under the supervision of the chief of section and assisted by No. 4, No. 5 replaces charges in the cartridge case in proper numerical order prior to repacking. He must check that all 4 charges of the proper lot number are present and in a serviceable condition.

Section II. DIRECT LAYING, GENERAL

29. General

a. Firing by direct laying is a special technique that demands a high standard of training. The section must operate as an independent unit. Training in direct laying is based on the technique employed in indirect laying. Enemy targets taken under fire by the section in direct laying are usually those capable of returning fire on the gun section at point-blank range; therefore, the speed and accuracy required in direct laying must be emphasized.

b. The one-man one-sight system is used for direct laying with this weapon in which the gunner lays for both direction and range using the panoramic telescope. (pars. 33-40).

30. Preparation of a Range Card

a. The chief of section is responsible for defense in his assigned sector. He should be prepared to deliver direct fire in all sectors.

b. As soon as possible after occupying a position,

the section chief measures or estimates the ranges to prominent terrain features near likely avenues of approach for enemy tanks and vehicles, and prepares a range card (FM 6-75) on which he notes the ranges for quick reference. This card should be prominently displayed at the piece at all times.

c. If there are no prominent terrain features, stakes may be driven into the ground at critical points for reference. As time permits, the range card should be improved by replacing estimated ranges with more accurate ranges obtained by firing, pacing, taping, vehicle speedometer reading, map measurement, or survey.

d. The battery executive assigns point numbers to certain prominent terrain features around the battery area. This facilitates sending the direct fire order to the firing battery by the executive or outpost; for example, TARGET, TANKS, POINT NO. 4, FIRE AT WILL.

e. As time permits, a deflection and quadrant for the point numbers should be added to the range card to increase accuracy in night firing, when the points are not clearly visible through the telescope (FM 6-75).

31. Field of Fire

a. The sections are given fields of fire which are integrated into the battery defense plan. These sectors of responsibility must overlap slightly and provide allround coverage.

b. The sector of fire for the howitzer should, if possible, be cleared of all obstructions that might endanger battery personnel when the piece is fired, or that

might hinder observation. Care should be taken not to expose the location of the position.

32. Conduct of Fire

a. *Trajectories.* Trajectory characteristics change with the type ammunition fired. HEAT or HE with charge 4 should be used for direct laying. The following trajectory characteristics govern the conduct of fire:

- (1) *Ranges from 0 to 400 meters using HEAT or ranges from 0 to 700 meters using HE with charge 4.* Within these range limits the trajectory will be flat enough to prevent an 8-foot armored vehicle from passing safely under it. Fields of fire and terrain allowing the maximum ranges as stated above are the ideal at which to open fire. Fire can be conducted for the maximum time without misses if deflection is correct. Also there is less risk of obscuring the target with smoke from a short burst.
- (2) *Ranges above 400 meters using HEAT, and ranges above 700 meters using HE, charge 4.* This zone includes ranges at which hits are only reasonably possible. Bracket methods of adjustment normally will be required due to the vertical change induced at greater ranges. Fire should not be opened above these ranges unless surprise is not important, or the tactical situation so dictates.

b. *Types and Selection of Targets for Direct Laying.* Targets for direct laying usually consist of hostile vehicles, tanks, and personnel threatening the battery. Enemy personnel, whether alone or accompanying

tanks, will seldom present themselves as a clearly defined target. Normally, attacking infantry, using all available cover, reveal themselves only fleetingly. Accordingly fire is conducted on the area containing the attackers rather than upon the individuals. Tanks usually attack in groups and may be accompanied by infantry. Normally, first priority is given to attack of those targets within the assigned sector of the weapon and second to targets in other sectors. Priority within the assigned zone is given to—

- (1) Tanks at short ranges, threatening to overrun the position.
- (2) Hull down stationary tanks, covering the advance of other tanks.

c. Ammunition and Fuzes.

- (1) *General.* For close-in fires, a variety of fuzes and shells are available. When high explosive shell is used, charge 4 is used habitually for speed, ease in adjustment, more effective fuze action, and imparting forward motion to fragments. The flat trajectory resulting from the use of charge 4 coupled with dug-in weapons may make extremely close-in fire impossible due to projectiles skipping without detonating on impact. At ranges of 200 to 400 meters fuzes may fail to function on hard, flat ground; however, preparation of sectors of fire will remedy this situation. The terrain may be prepared for direct fire by placing mounds of sandbags, dirt, or logs in the section's sector of responsibility. When direct fire is placed on these or other previously selected points, as they are approached by an

attacking force, the necessity for adjusting fire is reduced.

- (2) *Ammunition.* Ammunition may be HE, HEAT, or white phosphorous (WP). HEAT is designed for, and is highly effective in, anti-tank and antivehicle fires. HE is ideally suited for antipersonnel fire and is effective against vehicles and tanks. WP may be used to set immobile tanks and vehicles on fire, to further restrict defiles, and to produce casualties. However, consideration must be given to the effect on the defense of the resulting smoke screen.
- (3) *Fuzes.* Base detonating fuzes are contained in HEAT projectiles. WP ammunition is fuze with a superquick-delay fuze; HE may be used with fuzes quick, delay, or time.
 - (a) Fuze quick is the most desirable fuze to use with HE shell for close-in fires. It is highly effective and, since no fuze setting is required, is much faster to use.
 - (b) The time required to set the fuze and to adjust the point of impact for maximum ricochet effect makes fuze delay less desirable than fuze quick. When using fuze delay to gain ricochet effect, the point of impact is adjusted 10 to 30 meters in front of the target. If less than 50 percent of the bursts are ricochet, the fuze should be changed to quick.
 - (c) Fuze time is the least desirable type of fuze for close-in fires. Due to the wide range dispersion resulting from variation in time of burning with short fuze settings, this fuze

should be used only for ranges of more than 1,000 meters. The areas covered effectively by air and ricochet bursts are similar.

Section III. DIRECT LAYING, ONE-MAN, ONE-SIGHT SYSTEM

33. Laying

Due to the limited traverse of the 75-mm pack howitzer, 106 mils, a combination of the *laying ahead* and *central laying method* of laying should be used.

a. *Laying Ahead.* The gunner does not track the target, but lays ahead of it for direction and adjusts for elevation as the target approaches the correct lead. When the target arrives at the correct lead and elevation the weapon is fired.

b. *Central Laying.* The gunner sets the lead in mils on the azimuth micrometer scale of the panoramic telescope and maintains the vertical hairline of the reticle on the center of the target by tracking. The weapon is then fired when the correct elevation is established.

c. *Combination of Laying Ahead and Central Laying.* When the chief of section announces the lead and elevation, the gunner sets the announced lead on the azimuth micrometer of the panoramic telescope, and the announced elevation on the elevation micrometer. The gunner then either traverses the piece if the deflection deviation is small, or causes the piece to be moved if the deflection deviation is large, until the line of site is ahead of the target. The tube is elevated until the horizontal hairline of the telescope is in the approximate horizontal plane with the target. As the target approaches the line of sight of the telescope,

minor adjustments will be required in deflection and elevation. When the mass of the target centers on the crosshairs of the telescope, the weapon is fired. If the target is traveling at a moderate or high rate of speed, it may be necessary to "track" the target a short distance prior to firing.

34. Chief of Section

The duties of the chief of section are as follows:

a. Conducts the Fire of His Piece. When the executive commands TARGET, TANK, RIGHT FRONT, FIRE AT WILL, or simply FIRE AT WILL, the chief of section takes control of his section.

b. Identifies or Selects the Target. When the executive designates an object as the target, the chief of section must correctly identify his target. If the target is a group of tanks or other objects, the chief of section selects the target that is the greatest threat to his own position or the position of the supported troops. The chief of section takes his post to the flank and slightly to the rear of the piece where his observation will not be obscured by the effects of muzzle blast and smoke.

c. Estimates the Range to the Target. A well prepared range card with ranges to key points provides the best means for determining the initial range. Without a range card, the range must be estimated.

d. Determines the Lead in Mils. Lead is determined by the speed of the target, range, and direction of the target. Suggested leads are shown in table III. From the observed effect, the lead is changed as necessary.

e. Determines the Elevation in Mils. The chief of section will determine an elevation from the estimated range to the target. Table IV shows elevations cor-

responding to 50 meter range increments. A conversion table may be prepared for other charges using the firing tables.

f. Gives Initial Command. The chief of section will give fire commands containing the following elements in sequence:

- (1) *Target designation.* The command is TARGET (TANK, etc.).
- (2) *Projectile, charge, and fuzes.* The command specifies the appropriate items in sequence; e.g., SHELL HE, CHARGE 4; FUZE DELAY or SHELL HEAT. With shell HEAT, no command for charge or fuze is necessary because the rounds are fixed.
- (3) *Lead.* The command is LEAD RIGHT (LEFT) (so much). See table III for lead estimations.

Table III. Approximate Leads for Direct Laying

Speed (MPH)	Lead			
	Target perpendicular to line of fire		Target 45° to the line of fire	
	Heat	Charge 4	Heat	Charge 4
0-5	5	5	5	5
5-10	10	10	5	5
10-15	15	10	10	10

- (4) *Method of fire.* Fire is continuous unless otherwise commanded. The piece is loaded

and laid as rapidly as possible and fired on the command of the gunner.

- (5) *Elevation.* The command is ELEVATION (). The elevation commanded by the chief of section is to be set on the elevation micrometer by the gunner. See table IV for elevations.

g. Gives Subsequent Commands, Based on Observed Effect.

- (1) *Change in lead.* During adjustment, the lead is changed by the command LEFT (RIGHT) (so much).

Table IV. Elevations Corresponding to 50 Meter Range Changes

Shell HEAT		Shell HE, Charge 4	
Meters	Elevation (mils)	Meters	Elevation (mils)
0	0.0	0	0.0
50	2.5 (2)	50	1.6 (2)
100	5.1 (5)	100	3.2 (3)
150	7.7 (8)	150	4.8 (5)
200	10.3 (10)	200	6.4 (6)
250	12.9 (13)	250	8.0
300	15.5 (16)	300	9.7 (10)
350	18.0	350	11.3 (11)
400	20.6 (21)	400	13.0
450	23.2 (23)	450	14.6 (15)
500	25.8 (26)	500	16.3 (16)
550	28.4 (28)	550	18.1 (18)
600	31.0	600	19.8 (20)
650	33.5 (33)	650	21.6 (22)
700	36.1 (36)	700	23.4 (23)
750	38.7 (39)	750	25.2 (25)
800	41.3 (41)	800	27.0

- (2) *Change in Elevation.* During the adjustment the elevation is changed by ADD (DROP) (so much), based on the range miss distance of the effect. These corrections may be estimated by the chief of section if the impact is in close proximity to the target, or reference may be made to table IV if the range miss distance is fairly large.

35. Gunner

The duties of the gunner are as follows:

a. Prior to Firing, the Gunner—

- (1) Centers cross-level bubble on the panoramic telescope mount.
- (2) Sets the deflection at 0, site at 300, and elevation at 0.

b. The gunner sets the announced lead on the azimuth micrometer, and the announced elevation on the elevation micrometer. He then causes the line of fire to be moved ahead of the target by directing the trails to be shifted in the appropriate direction.

c. Commands FIRE after No. 1 has called "Set" and he is properly laid for lead and elevation. Prior to commanding "fire", the gunner will withdraw his eye from the eyepiece to prevent injury when the piece recoils.

d. Follows subsequent fire commands.

36. Number 1

The duties of No. 1 are as follows:

- a. Opens and closes the breech.
- b. Calls "Set" when the piece is loaded.
- c. Fires the piece on command of the gunner.

37. Number 2

The No. 2 cannoneer loads the piece.

38. Number 3

The duties of No. 3 are as follows:

- a. Sets the announced lead and elevation corrections for subsequent commands.
- b. Levels the cross-level bubble.
- c. Calls "Ready".

39. Number 4

The duties of No. 4 are as follows:

- a. Passes ammunition to No. 2.
- b. Removes ammunition from the container.

40. Number 5

The duties of No. 5 are as follows:

- a. Shifts the trail on the command of the gunner.
- b. Assists No. 4 in preparing ammunition.

CHAPTER 6

TECHNIQUES AND SITUATIONS THAT REQUIRE SPECIAL ATTENTION

41. Precision in Laying

a. Sighting and laying instruments, fuze setters, and elevating and traversing mechanisms must be properly operated to reduce the effects of lost motion. This requires that the last motion in setting the instruments and in laying the piece be in the direction prescribed in this manual. To insure accurate laying, personnel who have duties in connection with laying the weapon must be required to verify the laying after the breech has been closed.

b. The line of sight in setting and reading a scale or centering a bubble should be at a right angle to the scale or level vial to prevent parallax errors. Bubbles should be centered exactly.

c. For uniformity and accuracy in laying on aiming posts, the vertical reticle of the panoramic telescope should be alined with the left edge of the aiming posts.

42. Aiming Points and Displacement Corrections

a. *General.* After the piece has been laid initially for direction it is referred to the aiming posts and usually to one or more distant aiming points. An aiming point must have a sharply defined point or vertical line clearly visible from the howitzer so that the vertical reticle of the panoramic telescope can be alined on exactly the same place each time the piece is relaid.

b. *Distant Aiming Point.* A distant aiming point is

selected at sufficient distance so that normal displacements of the weapon in firing of traverse will not cause a horizontal angular change in direction (with the same settings on the azimuth scales) of more than one-half mil. The executive officer usually designates any distant aiming point or points to be used.

c. Aiming Posts.

- (1) Two aiming posts are used for each weapon. Each post is equipped with a light for use at night. The most desirable distance from the howitzer to the far aiming post, considering accuracy of laying, visibility, and ability to control the aiming post lights, is 100 meters. The near post is set up halfway between the far post and the howitzer and is lined in by the gunner so that the vertical reticle of the telescope and the two aiming posts are in alignment. To insure equal spacing of aiming posts, the distance to both the near and the far post should be paced by the same man. Where ground conditions make pacing inaccurate, the distance from the piece to the posts may be measured using the panoramic telescope, with the aiming post as a stadia rod ((4) below).
- (2) For night use, the aiming post lights should be adjusted so that the far light will appear several feet above the near one. Placed in this way the two lights will establish a vertical line for laying the howitzer.
- (3) Since the panoramic telescope is mounted at considerable distance from the center of rotation of the top carriage, large changes in deflection will cause misalignment of the aim-

ing posts. Placing the aiming posts to the left front at a deflection of approximately 2,200 when the howitzer is in center of traverse will keep this misalinement to a minimum and still allow for maximum visibility (*d* below).

- (4) To measure the distance from howitzer to aiming posts the stadia method may be employed, using the panoramic telescope and the aiming post as measuring devices. Number 5 cannoneer, when setting out the aiming posts, holds the upper section of one of the aiming posts in a horizontal position, perpendicular to the line of sighting. The gunner measures the length of this section in mils on the reticle of the panoramic telescope. For example, the upper section of the aiming post is $4\frac{1}{2}$ feet long, and it measures 17 mils when it is 100 meters from the howitzer. The proper location for the near post, in this case, would be at the point at which the $4\frac{1}{2}$ -foot section measures 34 mils. In many cases, the ideal spacing of 50 and 100 meters cannot be obtained but the posts will be properly spaced when the near post is set at a point at which the $4\frac{1}{2}$ -foot section measures twice the number of mils it measured at the far post location. This measurement may be performed at night by attaching the night lighting devices at the $4\frac{1}{2}$ -foot marks on the aiming posts.

d. Correction for Displacement of Aiming Posts.

When the gunner notes that the vertical reticle of the telescope is displaced from the line formed by the two aiming posts (or aiming post lights), he lays the

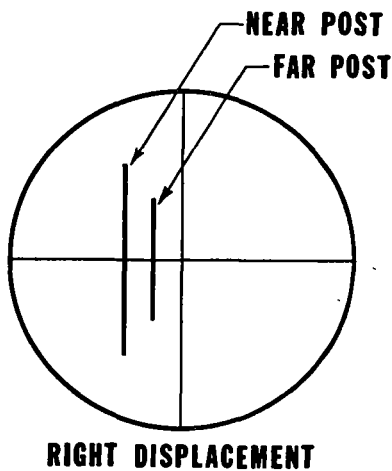
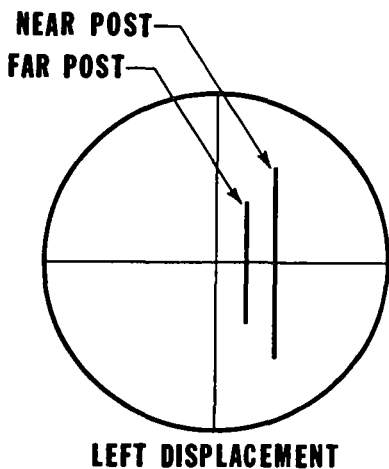


Figure 12. Gunners sight picture for correction, aiming post displacement.

howitzer in such a manner that the far aiming post (light) appears exactly midway between the near aiming post (light) and the vertical of the reticle (fig. 12). If the displacement is due to traversing the piece, the gunner continues to lay as described above. If the displacement is due to progressive shifting of the carriage from shock of firing or other causes, the gunner will notify the chief of section, who, at the first lull in firing, will notify the executive and request permission to realine the aiming posts. To realine, the howitzer is laid with the far post midway between the near post and the vertical reticle. The far aiming post is moved into alinement with the vertical reticle of the telescope and then the near aiming post is alined. If terrain conditions make it impracticable to move one of the two aiming posts, the howitzer is laid for direction and referred to the aiming post which cannot be moved. This deflection is reported to the executive.

43. Preparation of Position for Emplacement of Howitzer

a. General. For detailed information on the preparation of the howitzer position see FM 5-15 and FM 6-140. The howitzer should be emplaced on level ground to insure stability in firing and to reduce the time needed for leveling the telescopes and range quadrant.

b. Trail Trench. The trail of the pack howitzer must be moved in order to make most deflection shifts. A trail trench formed as an arc with its radius equal to the distance from the axle of the piece to the trail spade is desirable and facilitates shifting the trail. A trail log 18 to 20 inches in length and roughly squared to 6 by 6 inches may be lashed to the trail spade. The

trail log provides for transmission of the shock of recoil throughout the whole of the trail spade, and prevents buckling of the trail, especially when firing on rocky or frozen ground.

c. Recoil Pits. To provide clearance between the breech and the ground for high-angle fire, a recoil pit approximately 12 inches deep must be dug. For a quadrant elevation above 800 mils, due to maximum elevation limits of the piece, the trail must be dug in to provide a high-angle capability.

44. Cease Firing

The command CEASE FIRING normally is given to the howitzer section by the chief of section, but in emergencies anyone present may give the command. At this command, regardless of its source, firing will cease immediately. If the howitzer is loaded, the chief of section will report that fact to the executive. The executive acknowledges this report by repeating it, "Number (so-and-so) loaded." If the command CEASE FIRING comes from the fire direction center, firing is resumed at the announcement of the quadrant; if from within the firing battery the executive will investigate the condition which caused the command to be given. When the condition has been corrected, firing is resumed by the executive's announcement of the quadrant.

45. Changes in Data During Firing

If it is necessary to correct any element of firing data, all firing previously ordered, but not yet executed, is stopped by the command CORRECTION. Corrected data is then announced. If the piece is not already loaded, the new data will be set off and firing

resumed at the announcement of the quadrant. If the piece is loaded at the announcement of a new element of firing data, the new data will be set off. If no change in fuze setting is required, or if the piece is loaded with percussion-fuzed shell, firing is resumed at the announcement of quadrant. If loaded with time-fuzed shell and the data required a change in fuze setting, the chief of section will suspend firing and that fact will be reported to the executive; for example: "Number 2 loaded, time (so much)." In continuous fire, changes in data are so applied as not to stop the fire or break its continuity.

46. To Unload the Howitzer

a. A complete round, once loaded, should be fired in preference to being unloaded, unless military necessity dictates otherwise.

b. When the command UNLOAD is given, No. 1 opens the breech slowly; No. 2 standing at the breech, receives the ejected round or cartridge case.

c. Should the extractor fail to extract the complete round, the staff and unloading rammer (head) is used. This will be done under the immediate supervision of the chief of section. He inspects the recess in the head of the rammer to assure that it is free of obstructions. No. 1 then inserts the rammer in the bore until the head incloses the fuze and comes into contact with the projectile. He pushes and, if necessary, taps the rammer staff lightly, until the round is dislodged. He then pushes it out of the breech and No. 2 receives it.

d. If the cartridge case is extracted but not the projectile, No. 1 fills the chamber with waste and closes the breechblock. He dislodges the projectile as

in *c* above. No. 2 then opens the breech, removes the waste, and receives the projectile as No. 1 pushes it to the rear.

e. For further information pertaining to unloading see TM 9-319.

f. In case of a misfire, the instructions contained in paragraph 83 will be followed.

47. Care of Ammunition

a. To insure uniform results in firing, to prolong the life of the tube, and to avoid accident, great care must be exercised in the storage and handling of ammunition at the battery. The provisions of TM 9-1900 applicable to field service should be followed carefully. In the field, conditions existing in each position will determine the time, labor, and materials required to store and preserve the ammunition adequately. If the position is to be occupied for only a few hours, a tarpaulin spread on the ground may be sufficient; for longer periods of time, more elaborate facilities should be provided.

b. Ammunition must be protected from damage. When ammunition is received, it should be sorted into lots and placed in the best available storage. Powder temperature should be kept as uniform as possible. Ammunition data cards should be kept until all ammunition for that lot is expended. Ammunition should be left in containers until its early use is expected. Protection should be provided against moisture, dirt, direct rays of sun, and, as far as practicable, hostile artillery fire and bombing. Protection against weather, dirt, and sun may be obtained by the use of tarpaulins below and above the ammunition and suitable dunnage between the layers. Protection against hostile fire may

be obtained by the use of small dispersed stacks, trenches, or dugouts. Each stack should contain not more than 75 rounds and should be not more than 4 layers high. Stacks should be at least 10 meters apart.

c. For further information on care of ammunition see FM 6-40, FM 9-5, TM 9-319, TM 9-1900, and TM 9-1300-203.

CHAPTER 7

BORESIGHTING AND BASIC PERIODIC TESTS

Section I. GENERAL

48. Purpose and Scope

The purpose of this chapter is to outline the procedures for boresighting and making basic periodic tests of on-carriage fire control equipment. The procedures covered will include only those that may be accomplished at battery level.

49. Equipment

The following equipment is needed for boresighting and periodic tests:

a. Boresights. Front and rear boresights or improvised substitutes are necessary for both boresighting and testing. If boresights are not available, cross-hairs may be fastened on the muzzle, and the firing pinhole in the breechblock bushing may be used as a rear sighting guide by removing the firing lock from the closed breechblock.

b. Testing Target. A testing target or suitable substitute is needed for both boresighting and testing (fig. 13). Testing targets will be more useful if the following improvements are made.

- (1) The target should be mounted on a flat piece of masonite, wallboard, or similar material.
- (2) To insure stability of the testing target throughout boresighting, it should be fastened to a stand or a stake.
- (3) For use in either leveling or canting the test

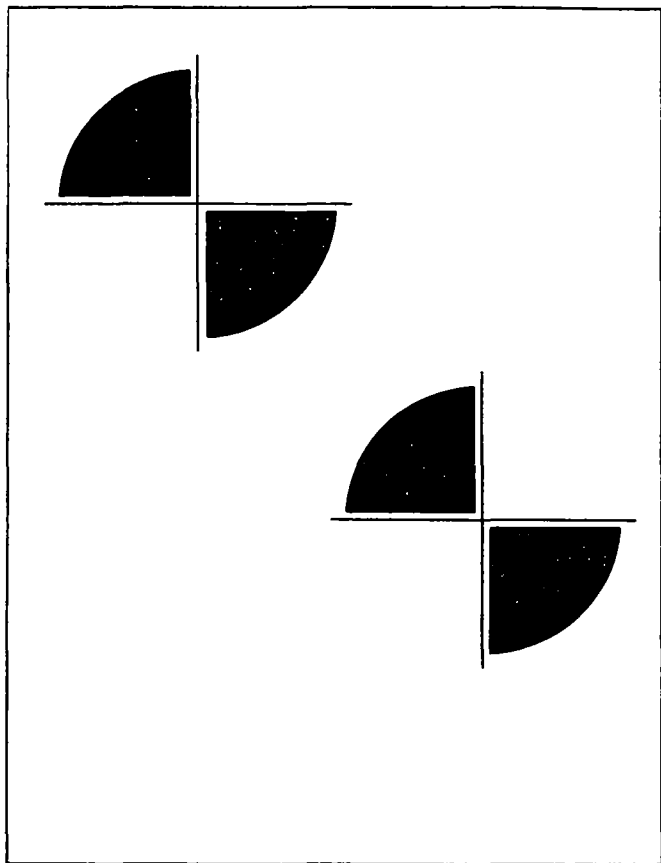


Figure 13. Testing target.

target (FM 6-75) a mil scale may be inscribed at the bottom of the target. A small nail at the top marks the center from which the arc was drawn and provides a hook from which to suspend the plumbline.

- (4) Vertical reference lines may be drawn through the centers of each of the diagrams. These lines may be used when the trunnions cannot be leveled by setting the test target with a cant angle of the gun. The target is rotated until the line of sight through the tube tracks the reference line when the tube is elevated and depressed. Similarly, the panoramic telescope should be adjusted so that its reticle tracks the appropriate reference line when the tube is elevated and depressed.
- (5) To facilitate boresighting in darkness a 1/16-inch hole should be bored through the mounted testing target at the center of each aiming diagram. A flashlight held against the target behind the appropriate hole provides an aiming point for use in blackout conditions. Patches of felt padding should be fastened on the back of the target covering the regions of each hole so that light from the flashlight will not escape. The flashlight must be lighted only after it is placed firmly in position. Care must be taken to prevent disturbing the position of the testing target.
- (6) If a testing target is not available, a clearly defined aiming point 2,000 or more meters from the gun may be used for the same purpose as the testing target.

c. Tools. The section equipment includes all the necessary tools for boresighting and testing. Care must be taken in using screwdrivers and wrenches to insure that damage does not result from carelessness or the use of inappropriate tools.

d. Plumbline. Although a plumbline is not essential

for boresighting, it is highly desirable that one be used in the basic periodic test for maximum accuracy. For additional information refer to TM 9-319.

Section II. BORESIGHTING

50. General

a. Description. Boresighting is the process of alining the on-carriage fire control equipment so that its optical axis is parallel to the axis of the bore. It consists of those tests and adjustments which are performed by section personnel to insure accuracy in laying for elevation and direction. The piece should be placed near its center of traverse prior to boresighting. All instruments and mounts must be positioned securely; there must be no free play. Boresighting is conducted before firing and when necessary during lulls in firing.

b. Leveling. Prior to initiating boresight procedures the piece should be leveled. The howitzer is leveled by jacking up the axle near the wheel on the low side, or by digging out soil from under the high wheel. Methods employed in leveling are as follows:

- (1) *Plumbline.* The best method to check leveling is by means of a plumbline. This method should be used in conjunction with basic periodic tests or under field conditions when time is not critical. With the plumbline installed directly in front of the axis of the bore, aline the vertical line of the telescope with the plumbline. Rotate the telescope in a vertical plane throughout its travel limits, if the vertical line of the telescope does not remain in coincidence with the plumbline, depress the

tube, shift the trail, and repeat the process until coincidence is maintained throughout the vertical limits of travel.

- (2) *Gunner's quadrant.* This method of leveling will normally be used in field conditions. The gunner's quadrant is placed parallel with the axle and cross leveled as in *b* above. A quadrant that has been tested (par. 55) and found to be accurate is required.

51. Testing Target Method

This method brings the line of site of the on-carriage fire control equipment in alinement with the tube using aiming diagrams on the testing target as aiming points. Steps to be followed are—

- a. Level the howitzer (par. 50).
- b. Level the tube using the gunner's quadrant. Angle of site scale should indicate 300, and elevation zero.
- c. Install the breech and muzzle boresights.
- d. Without moving the howitzer, except for elevating and depressing slightly when alining the testing target reference lines, aline the center of the testing diagram with the line of sight through the tube. The target normally should be placed 50 meters in front of the howitzer.
- e. Aline panoramic telescope.
 - (1) Aline the panoramic telescope by turning the elevation and azimuth knobs so that the intersection of the crosshairs on the reticle are on the telescope aiming point of the diagram.
 - (2) If the azimuth scale does not indicate zero, loosen the four headless screws which secure the clamping ring and turn the scale to indicate zero. Tighten the screws.

- (3) If the azimuth micrometer does not indicate zero, loosen the slotted nut in the azimuth knob, while preventing the knob from turning; shift the micrometer to indicate zero, and tighten the slotted nut.
- (4) If the elevation micrometer does not indicate zero, loosen the three screws in the knob, while preventing the knob from turning; shift the micrometer to indicate zero, and tighten the screws.

Caution: Do not pull the knob out as stop rings under knob may become disengaged.

Adjustment of coarse elevation index will be made by ordnance personnel.

f. Aline elbow telescope.

- (1) Aline the elbow telescope in azimuth by turning the azimuth micrometer knob. Loosen the elevation clamp screw, shift the telescope in elevation to aline the horizontal line on the reticle.
- (2) Adjustment of azimuth and elevation indexes are the same as in *e* above.

52. Distant Aiming Point Method

This method consists of alining the on-carriage fire control equipment and the line of sight through the tube on a common point at least 2,000 meters from the howitzer. A distant aiming point may be used instead of the testing target if the testing target is not available or if the tactical situation makes its use impracticable. The steps prescribed for the testing target method (par. 51) apply except that the boresights and

optical sights are alined on the same point instead of on the two diagrams of the testing target. Accurate cross-leveling of the piece is unnecessary when bore-sighting on a distant aiming point, because the lines of sight converge on a single point.

53. Standard Angle Method

The standard angle method of boresighting cannot be used with this weapon, because line of sight cannot be obtained between the panoramic telescope and the muzzle of the howitzer.

Section III. BASIC PERIODIC TESTS

54. General

Basic periodic tests are performed by the section under the supervision of the battery executive and the artillery mechanic. These tests are performed at the discretion of the unit commander. Suggested times for performance are once each year if the howitzer is used only for nonfiring training; once every 3 months if the howitzer is fired; as soon as possible after extensive use, accidents, or traversing extremely rough terrain; and whenever the howitzer fires inaccurately for no readily apparent reason. The tests reveal whether or not the on-carriage sighting equipment and certain off-carriage equipment are in correct adjustment. For the on-carriage equipment to be correct adjustment, the following conditions must be met:

a. The line of sight of the panoramic telescope or the elbow telescope must be parallel to the axis of the bore.

b. All indexes and scales, except the angle of site

scale, must read zero. The angle of site scale must read 3(300).

c. All bubbles must be in adjustment and centered.

d. The sighting equipment must satisfactorily meet all tests described in paragraphs 51 and 52.

e. Prior to all tests of on-carriage fire control equipment it is desirable that the piece be level. Leveling the piece is most easily accomplished by jacking up one side of the axle. The best check that the piece is level is accomplished by insuring that the axis of the bore tracks a plumbline as described in paragraph 50.

55. Test of Gunner's Quadrant

a. *General.* The gunner's quadrant must be in proper adjustment before tests and adjustments of other sighting and fire control equipment are conducted. Inspect the shoes of the gunner's quadrant for dirt, nicks, or burrs. Similarly, inspect the leveling plates on the breechblock. Dirt, nicks, or burrs on these surfaces will cause the instrument to give inaccurate readings.

b. *End-for-End Test.*

- (1) Set the index arm and the micrometer scale at zero, making sure the auxiliary indexes match.
- (2) Place the quadrant on the leveling plates of the breechblock, the line-of-fire arrow pointing toward the muzzle. Center the quadrant bubble by turning the elevating crank.
- (3) Reverse the quadrant on the leveling plates (turn it end-for-end). If the bubble recenters, the quadrant is in adjustment and the test is completed.

- (4) If the bubble does not recenter, try to center it by turning the micrometer knob.
 - (a) If bubble centers, read black figures and divide by two.
 - (b) Place results on micrometer; level tube using elevation crank.
 - (c) Check by again reversing the quadrant. Bubble should center.
 - (d) The reading on the quadrant is the error.
- (5) If bubble doesn't center as in (4) above, move the arm down one graduation (10 mils).
 - (a) Turn micrometer until bubble centers.
 - (b) Take reading on micrometer, add 10 to it, and divide sum by 2.
 - (c) Place this reading on micrometer, leaving the arm at minus 10; level tube with elevation crank.
 - (d) Check by reversing quadrant on seats. Bubble should center.
 - (e) If bubble centers, subtract micrometer reading from 10. This is the error.
 - (f) Quadrant should be sent to ordnance if correction of error amounts to more than plus or minus 0.4 mil.

c. Micrometer Test.

- (1) Set the index arm to read 10 mils on the graduated arc and set the micrometer scale at zero.
- (2) Place the quadrant on the leveling plates on the breech ring, the line-of-fire arrow pointing toward the muzzle, and center the quadrant bubble by elevating the tube.
- (3) Set the index arm at zero on the graduated

arc and turn the micrometer one revolution to read 10 mils.

- (4) Reseat the quadrant on the leveling plates. The bubble should center.

Caution: Do not disturb the laying of the tube.

- (5) If the bubble does not center, the micrometer is in error and must be adjusted by ordnance personnel.

d. Comparison Test. Compare readings taken at low, medium, and high elevations with all the gunner's quadrants in the battery on a *single* howitzer whose quadrant seats have been accurately cross-leveled. Any quadrant differing from the average by more than 0.4 mils at any elevation should be sent to ordnance for adjustment.

e. Correction. When a gunner's quadrant requires a correction as determined by the end-for-end test, the correction is *not* carried during firing but is applied only when making sight tests and adjustments.

56. Adjustment of Sightunits

Sightunit adjustment is normally conducted "in garrison" or under field conditions when time is not critical. The following tests will be conducted and detailed procedures are contained in the following indicated paragraphs of TM 9-319.

a. Test Telescope Mount Cross-Level and Angle of Site Level Bubbles. Paragraph 180d(2)(b)(1) and (2).

b. Test Azimuth Compensating Mechanism. Paragraph 180d2(b)(3).

c. Test Telescope Mount Scales. Paragraph 180d(3).

57. Ordnance Check

It is not contemplated that using units will have the necessary facilities, tools, or skilled mechanics to perform the more precise tests and adjustments of sighting and fire control equipment. When deficiencies recur or when defects cannot be corrected in the field, ordnance checks should be scheduled.

58. Fuze Setters

a. *General.* Examine the stop which fits into the slot in the movable time ring and the adjusting pawl which engages the notch in the fixed fuze ring to see that their edges are not burred or bent. Depress the adjustable pawl against its spring to see that the movement of the pawl is free. In the following test be sure to test the fuze setter with the fuze for which it is designed; the time scale on the fuze setter must have the same graduations as the time ring on the fuze.

b. *Time Scale Test.* Set the corrector to 30 and set any convenient time on the time scale. Test the time scale of the fuze setter by setting several fuzes.

Caution: Before setting a fuze, make sure that the T- and C-screws (of the fuze setter) are tight to prevent any slipping of the scale indexes when the handle of the fuze setter is rotated. The time set on the fuze should agree with the time setting on the fuze setter within one-fourth of the smallest graduation on the fuze time ring. The tolerance amounts to 0.05 second for fuzes having 0.2-second graduations, and 0.125 second for fuzes having 0.5-second graduations. If the fuzes set do not agree with the time set on the fuze setter, repeat the test as a check with a different setting. If the fuzes set still do not agree with the fuze setter,

refer the instrument to ordnance for adjustment.

Caution: Do not set any live fuze more than twice. The fuze from a dud must never be used. Reset all fuzes to *safe* and replace the safety wire or cotter pin.

CHAPTER 8

MAINTENANCE AND INSPECTIONS

59. General

Maintenance and inspections are essential to insure that the howitzer section is prepared to carry out its mission immediately. Systematic maintenance procedures and inspections provide the best insurance against mechanical failure and breakdown.

60. Disassembly, Adjustment, and Assembly

Authorized disassemblies and adjustments to be performed by battery personnel are prescribed in TM 9-319. No deviations from these procedures are permitted except when authorized by the responsible ordnance officer.

61. Records

The principal records pertaining to the weapon are the equipment logbook, and DA Form 2407 (Maintenance Request). For detailed information on the use of these forms see TM 38-750.

62. Maintenance

For detailed instructions concerning maintenance of the 75-mm pack howitzer see TM 9-319 and LO 9-319. For detailed instructions concerning maintenance of the vehicle being used as a prime mover, see the technical manuals and lubrication orders pertaining to that vehicle.

63. Inspections

Regular inspections are required to insure that materiel is maintained in serviceable condition.

a. The chief of section is responsible for the equipment within his section. He should inspect it thoroughly each day. If he sees the need for repair or adjustment, he notifies the battery executive immediately so that the necessary action can be taken.

b. The executive, accompanied by the artillery mechanic, should make a daily informal command inspection. Each day he should inspect different parts of the weapons, thereby insuring complete coverage every few days. At least once a month, the executive should make a thorough mechanical inspection of the weapons, auxiliary equipment, tools, and spare parts.

c. Battery, battalion, and higher commanders should make frequent command inspections to assure themselves that the equipment in their commands is being maintained at prescribed standards of condition, appearance, and completeness.

d. For details on inspecting the 75-mm pack howitzer see TM 9-319. For details on inspecting the vehicle being used as a prime mover see the appropriate technical manual for that vehicle. Deficiencies found during inspections should be remedied promptly.

e. Duties of individuals in performing the necessary inspections and maintenance of the howitzer are outlined in paragraphs 64, 65, and 66. Work will become routine, thorough, and rapid if the drills outlined in these paragraphs are followed. When the section is reduced in strength the chief of section must reassign duties to insure that all maintenance steps are completed.

64. Inspection Duties Before Operation

The inspection performed before operation is a final

check on materiel made prior to leaving the motor park for training in the field, the bivouac area for combat, or before displacement. After inspection, and when all deficiencies have been corrected, the section is ready to go into action. Detailed duties are as follows:

a. Chief of Section.

- (1) Supervises members of the gun section during the inspection.
- (2) Verifies howitzer is properly coupled.
- (3) Inspects recoil system for leakage.
- (4) Checks oil index to verify that the index is even with the front face of the recess.
- (5) Inspects ammunition for lot number, amount, condition, and stowage.
- (6) Checks for proper supply of gasoline, oil, water, and rations.
- (7) Inspects loading of section equipment for completeness and security.
- (8) Checks presence of technical manuals, lubrication orders for howitzer and prime mover, drivers accident report form, vehicle accident identification card, and equipment logbook.
- (9) Receives reports from section personnel when duties are completed.
- (10) Supervises the driver and crews performance of the before operation service performed on the prime mover.
- (11) Reports, "Sir, No () in order," to the executive officer, or any defects that cannot be immediately remedied by the section.

b. Gunner.

- (1) Inspects for presence of all fire control and

sighting equipment, cleans, secures and to the extent authorized, lubricates them.

- (2) Releases a small amount of recoil oil until the index has slightly receded into its recess. He then reestablishes the correct oil index reserve, bringing the oil index even with the face of the index.

Caution: The howitzer must not be fired with a deficient or excess oil reserve as it may do irreparable damage to the recoil mechanism.

- (3) Checks contents of the section chest.

- (4) Reports, "Gunner Ready."

c. Number 1.

- (1) Inspects the breechblock and the tube. Insures tube is clean and lightly oiled.

- (2) Adjusts the respirator (TM 9-319).

- (3) Reports, "No. 1 Ready."

d. Number 2.

- (1) Inspects condition and security of the rammer staff and trail hand spike.

- (2) Inspects howitzer light system.

- (3) Inspects tires for serviceability, and wheels for loose or missing nuts and screws.

- (4) Assures adequate supply of cleaning and preserving materiel.

- (5) Reports, "No. 2 Ready."

e. Number 3.

- (1) Inspects carriage for loose or broken parts, condition of tube fittings and cracked or broken welds.

- (2) Inspects fuze setter.

- (3) Reports, "No. 3 Ready."

f. Numbers 4 and 5.

- (1) Loads ammunition and section equipment.
- (2) Duties as prescribed by the chief of section.
- (3) Reports, "No. 4 (5) Ready."

g. Driver.

- (1) Performs "before operation" services as prescribed in the technical manual for the prime mover.
- (2) Reports, "Driver Ready."

65. Inspection Duties During Operation

The inspection performed during operation is a continuous check on the operation of the materiel to insure that all equipment will be employed in the best possible condition. The responsibilities and duties are as follows:

a. Chief of Section.

- (1) Rides in the cab with the driver and supervises march discipline.
- (2) Assigns duties for air defense and antimechanized security.
- (3) Supervises the driver in the observance of the prime mover instruments and controls for proper functioning and listens for unusual noises indicating malfunctioning of the vehicle or weapon.

b. Gunner.

- (1) Listens for abnormal or unusual noises and observes towed load for security.
- (2) Signals chief of section in case of malfunction.

c. Numbers 1 through 5 Inclusive.

- (1) Perform duties as air defense and antimech-

anized security sentries when assigned by chief of section.

- (2) Signals chief of section in case of malfunction.

d. Driver. Performs *during operation* services as prescribed in the prime mover technical manual.

66. Inspection Duties During Halt

The inspection at the halt is made to insure that the howitzer and prime mover are in good condition. This inspection includes checks of items which cannot be checked during the march and is performed as soon as a halt is made. The chief of section, on being told the length of halt, will divide halt time between relief of personnel and maintenance of prime mover and howitzer. Duties are as follows:

a. Chief of Section.

- (1) Commands, PERFORM HALT INSPECTION.
- (2) Supervises inspection and maintenance.
- (3) Insures personnel remain to the right of the left wheels except to inspect the left wheels.
- (4) Receives reports from personnel upon completion of their duties.
- (5) Reports "Sir, No. () in order," to the executive officer, or any defects that the section cannot remedy without delay.

b. Gunner.

- (1) Inspects for presence, condition and security of sighting equipment, staff sections, aiming posts, handspike, and section chest.
- (2) Reports, "Gunner ready."

c. Number 1.

- (1) Inspects coupling of howitzer to prime mover.

(2) Inspects functioning and condition of lighting system.

(3) Reports "No. 1 ready."

d. Number 2.

(1) Inspects tires and wheels for serviceability.

(2) Inspects wheels for missing and loose nuts and screws, and overheated bearings.

(3) Reports, "No. 2 ready."

e. Numbers 3 through 5 inclusive.

(1) Performs duties as prescribed by the chief of section.

(2) Reports, "No. 3 (4 and 5) ready."

f. Driver.

(1) Performs *at halt* services prescribed for his vehicle.

(2) Reports, "Driver ready."

67. Inspection Duties Prior to and During Firing

Inspection before and during firing is a continuing inspection to insure proper functioning of materiel. No command is necessary; each member of the section performs appropriate inspections throughout pre-firing and firing periods as shown in *a* through *e* below.

a. Chief of Section.

(1) Supervises and commands section as prescribed in chapters 4 and 5.

(2) Supervises servicing of recoil system and testing and adjustment of sighting and fire control equipment prior to firing.

b. Gunner.

(1) Tests and adjusts sighting and fire control equipment prior to firing.

- (2) Performs inspection duties in firing as prescribed in chapters 4 and 5.

c. Number 1.

- (1) Inspects and cleans bore and breech mechanism. Insures tube condition is clean and dry.
- (2) Performs inspection duties as prescribed in chapters 4 and 5.

d. Numbers 2 Through 5 Inclusive. Performs inspection duties as prescribed in chapters 4 and 5.

e. Driver. Moves his vehicle to a designated parking area, and performs *after operation* services as prescribed in the technical manual for the prime mover.

68. Inspection Duties and Maintenance After Operation

After operation, the howitzer is immediately given servicing and maintenance checks necessary to prepare for further action or to determine maintenance needs by higher echelons. Detailed duties are as follows:

a. Chief of Section.

- (1) Commands INSPECT EQUIPMENT, and supervises the inspection and maintenance of the howitzer and prime mover.
- (2) Inspects tools, accessories and equipment for serviceability.
- (3) Inspects ammunition for lot number, complete rounds, and condition.
- (4) Inspects recoil system for leakage and supervises filling if required (TM 9-319).
- (5) Makes required entries in equipment log-books, and other required documents.

- 6) Verifies prescribed supply of gasoline, oil, water, and emergency rations.
 - (7) Receives reports from section personnel as they complete their duties.
 - (8) Reports "Sir, No. () in order."
- b. *Gunner.*
- (1) Inspects, cleans, secures, and lubricates to the extent authorized, all sighting and fire control equipment.
 - (2) Inspects bore and breech mechanism after cleaning.
 - (3) Inspects general condition of the howitzer.
 - (4) Reports, "Gunner ready."
- c. *Number 1.*
- (1) Removes, inspects, cleans, oils, and replaces breech mechanism.
 - (2) Cleans and oils bore, assisted by No. 2.
 - (3) Reports, "No. 1 ready."
- d. *Number 2.*
- (1) Assists No. 1 in cleaning bore and breech mechanism.
 - (2) Cleans and replaces rammer staff and hand-spike.
 - (3) Inspects tires and wheels for serviceability.
 - (4) Removes and cleans lighting system.
 - (5) Reports, "No. 2 ready."
- e. *Number 3.*
- (1) Lubricates howitzer and carriage (LO 9-319).
 - (2) Inspects carriage for loose or missing nuts, bolts, and broken welds.
 - (3) Cleans, lubricates, and returns fuze setter to the section chest.
 - (4) Reports, "No. 3 ready."

f. Number 4.

- (1) Assists No. 3 to lubricate carriage.
- (2) Cleans howitzer and carriage.
- (3) Reports, "No. 4 ready."

g. Number 5.

- (1) Cleans, lubricates and stows aiming posts.
- (2) Cleans howitzer and carriage.
- (3) Stores unused cleaning and preserving materials.
- (4) Reports, "No. 5 ready."

h. Driver.

- (1) Performs after operation services as prescribed in the technical manual for the prime mover.
- (2) Reports, "Driver ready."

69. Duties in Weekly Inspection and Maintenance

In garrison, these duties are performed weekly. On maneuver or in combat, they are performed after each field operation.

a. Chief of Section.

- (1) Supervises section in weekly inspection and maintenance of weapon, tools, accessories, and equipment. See TM 9-319 and LO 9-319 for further details.
- (2) Obtains assistance of the artillery mechanic for operations requiring skill and tools beyond the capabilities of the section.

b. Gunner and Cannoneers Nos. 1 Through 5 Inclusive. Perform normal maintenance as directed by the chief of section.

CHAPTER 9

DECONTAMINATION OF EQUIPMENT

70. General

Equipment which has been contaminated by chemical, biological, or radiological agents constitutes a danger to personnel. *Contamination* is the spreading of an injurious agent in any form and by any means. Persons, objects, or terrain may be contaminated. *Decontamination* is the process of making any contaminated place or object safe for unprotected personnel. This can be done by covering, removing, destroying, or changing into harmless substances the contaminating agent or agents. Generally, only equipment contaminated by persistent agents needs to be decontaminated.

71. Decontamination for Chemical Agents

a. *Ammunition.* With rags, wipe off visible contamination from projectiles. Apply DANC (decontamination agent, noncorrosive) solution, wipe with gasoline-soaked rag, then dry. If DANC is not available, scrub with soap and cool water. Slurry (equal weights of water and chloride of lime) can be used on contaminated ammunition containers, but it must not be allowed to penetrate to the ammunition itself.

b. *Instruments.* If instruments are exposed to corrosive gases, clean as soon as possible with alcohol (or gasoline, if no alcohol is available), and apply a thin coat of light machine oil. Or, use a rag dampened with DANC, dry with a clean rag, and then apply a coat of machine oil.

Caution: DANC injures plastic or hard rubber surfaces.

c. *Weapons.* Remove dirt, dust, grease, and oil. Do not apply wet mix but allow surfaces to air after soil and dirt have been removed. DANC can be used on all metal surfaces except the bore. Boiling water, cleaning solvent, or repeated applications of gasoline on swabs are also effective. If an emergency requires the use of gasoline-soaked swabs (FM 21-40), extreme care must be taken to insure that the gasoline does not spread the contamination and that it does not remain in liquid or vapor form. Excess gasoline could ignite when the gun is fired. After decontamination, weapons are dried and oiled.

d. *Automotive Equipment.* Light contamination from spray can be decontaminated by aeration alone. For heavier contamination use DANC on interior or exterior surfaces which personnel are likely to touch. For larger area decontamination, wash vehicle with water and scrub painted surfaces with soap and water.

72. Decontamination for Biological Agents

a. Biological decontamination is the process of destroying biological agents or preventing them from reaching personnel.

b. A material employed to destroy biological agents must be effective against a multiplicity of organisms, rapid in action, nontoxic, and available in quantity at a reasonable price.

c. The standard chemical decontaminants; chloride of lime, slurry, DANC solution, soap and water, and commercially produced disinfectants, may be used for biological decontamination.

73. Decontamination for Radiological Agents

a. Unlike war gases, radioactive contaminants cannot be made safe by chemical action. They must be removed or shielded if it is impractical to wait for natural decay.

b. Radiological decontamination is the process of reducing the hazard of radioactivity by removal and disposal of the contamination, or by shielding against the radiation.

74. References

For further information on decontamination see FM 21-40, TM 3-220, and TF 3-1407.

CHAPTER 10

DESTRUCTION OF EQUIPMENT

75. General

a. Tactical situations may arise when it becomes necessary to abandon equipment in the combat zone. In such a situation, all abandoned equipment must be destroyed to prevent its use by the enemy.

b. The destruction of equipment subject to capture or abandonment in the combat zone will be undertaken only upon authority delegated by division or higher commanders.

c. All batteries must prepare plans for destroying their equipment in order to reduce the time required should destruction become necessary. The principles to be followed are—

- (1) Plans for destruction of equipment must be adequate, uniform, and easily carried out in the field.
- (2) Destruction must be as complete as the available time, equipment, and personnel will permit. Since complete destruction requires considerable time, the more essential parts are destroyed first.
- (3) The same essential parts must be destroyed on all like units to prevent the enemy from constructing complete units from damaged ones.
- (4) Spare parts and accessories must be given the same priorities as the parts installed on the equipment.

76. Methods

To destroy equipment adequately and uniformly, all personnel of the unit must know the plan and priority of destruction and be trained in the methods of destruction.

77. References

For detailed information on destruction of barrel assembly and recoil mechanism, carriage or mount, tires, and fire control equipment, see TM 9-319; for ammunition, see TM 9-1300-203. For destruction of vehicle, see the technical manual appropriate to the vehicle being used as a prime mover.

CHAPTER 11

SAFETY PRECAUTIONS

78. General

Safety precautions to be observed in training are prescribed in AR 385-63. Additional information is found in FM 6-140, TM 9-319, and TM 9-1900. The more important safety precautions are summarized in the following paragraphs.

79. Ammunition

a. All ammunition at the firing position must be so placed that it is protected against explosion in case of accident at the gun position. Flames and explosive materials such as gasoline must be kept away from the ammunition. Ammunition should be protected from direct rays of the sun by use of a tarpaulin or other suitable covering.

b. Battery personnel must not attempt to disassemble fuzes or remove primers from rounds.

c. If for any reason a round is not fired after the time fuze has been set, the fuze must be reset to SAFE before it is restowed.

d. All rounds not fired which have been prepared for firing must be checked by the chief of section, to insure that all four powder increments are present in proper order and condition, and that they are of the proper lot number. He also verifies that the lot number of the ammunition corresponds to the lot number on the container. A battery officer must certify that ammunition has been properly reassembled. For further details, see FM 6-140.

80. Misfires

a. In the event of a misfire, make two more attempts to fire the piece. If it does not fire, wait 2 minutes from the time of the last attempt before the executive commands UNLOAD.

b. Upon the command UNLOAD, No. 1 opens breech; No. 2 removes only the cartridge case, and inspects the primer. If the primer is dented, a faulty primer is indicated and the cartridge case is replaced. Take care to segregate the faulty cartridge case from serviceable cartridge cases. If the primer is not dented, a faulty firing mechanism is indicated.

c. See TM 9-319 for action to be taken in case the indent on the primer is light or if there is no indent, indicating that the firing lock is not functioning properly.

81. Drill and Firing

a. Keep the weapon unloaded except when firing is imminent.

b. Members of the gun section should pass in rear of the gun when going from one side to another.

c. Personnel must stay a safe distance from the breech to prevent injury during recoil.

d. During firing, personnel should use cotton or ear-plugs in their ears to protect eardrums against injury.

e. In training there must always be a safety officer for each artillery unit firing. For duties of the safety officer see FM 6-40.

APPENDIX I

REFERENCES

1. Miscellaneous Publications

AR 320-5	Dictionary of United States Army Terms.
AR 385-63	Regulations for Firing Ammunition for Training, Target Practice, and Combat.
AR 611-201	Manual of Enlisted Military Occupational Specialties.
AR 672-5-1	Awards.
AR 750-5	Maintenance Responsibilities and Shop Operation.
ASubjScd 6-3	Cannoneer and Rocketeer Instruction.
ATP 6-100	Army Training Program for Field Artillery Units.
ATT 6-117	Field Artillery Howitzer Battery Light and Medium.
ATT 6-155	Field Artillery Howitzer Battalion Light, Towed and Self-Propelled.
DA Pam 108-1	Index of Army Motion Pictures, Film Strips, Slides, and Phonorecordings.
DA Pam 310-series	Military Publications.
FM 5-15	Field Fortifications.
FM 5-20	Camouflage, Basic Principles and Field Camouflage.
FM 5-22	Camouflage Materials.

FM 5-25	Explosives and Demolitions.
FM 6-20-1	Field Artillery Tactics.
FM 6-20-2	Field Artillery Techniques.
FM 6-40	Field Artillery Cannon Gunnery.
FM 6-125	Qualification Tests for Specialists Field Artillery.
FM 6-140	The Field Artillery Battery.
FM 9-5	Ordnance Ammunition Service.
FM 21-5	Military Training.
FM 21-40	Small Unit Procedures in Nuclear, Biological, and Chemical Warfare.
FM 25-10	Motor Transportation, Operations.
TF 3-1407	Decontamination Procedure.
TM 3-220	Decontamination.
TM 5-200	Camouflage Nets and Net Sets.
TM 9-247	Materials Used for Cleaning, Preserving, Abrading, and Cementing Ordnance Materiel; and Related Materials, Including Chemicals.
TM 9-319	75-mm Pack Howitzer M1A1 and Carriage M8.
TM 9-575	Auxiliary Sighting and Fire Control Equipment.
TM 9-1300-203	Ammunition for Antiaircraft, Tank, Antitank, and Field Artillery Weapons.
TM 9-1527	Gunner's Quadrants M1 and M1918, and Machine Gun Clinometer M1917.
TM 9-1590	Fuze Setters.
TM 9-1900	Ammunition, General.

TM 9-2300	Artillery Materiel and Associated Equipment.
TM 9-6111	Panoramic Telescopes, M1, M12, M12A2, M12A5, ⁷ / ₁₁ and M12A6.
TM 21-300	Driver Selection and Training (Wheeled Vehicles).
TM 21-305	Manual for the Wheeled Vehicle Driver.
TM 38-750	Army Equipment Records System and Procedures.
FT 75-1-4	Firing Tables, Howitzer 75-mm M1, M1A1, M2 and M3.

2. DA Ord Supply Manual

SNL C-20	Howitzer, Pack, 75-mm M1A1: Carriage, Howitzer (Pack) 75-mm, M8.
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APPENDIX II

TRAINING

Section I. GENERAL

1. Purpose and Scope

The purpose of this appendix is to present the minimum requirements for training the personnel of a howitzer section in the performance of their duties in service of the piece. It includes general information on the conduct of training, a minimum training schedule, and tests to be given for the qualification of gunners.

2. Objectives

The objectives are speed in training cannoneers in their individual duties; and, through drill, to weld them into an effective, coordinated team able to function efficiently in combat. During training supervisors should keep in mind the proficiency sought by Army Training Tests (ATT) 6-117, and 6-155. Maximum efficiency is attained through continuous drills.

3. Conduct of Training

a. Training will be conducted in accordance with the principles laid down in FM 21-5. Its goals should be the standards set forth in AR 611-201, ATP 6-100, and FM 6-125.

b. Individual training is conducted by noncommissioned officers as far as practicable. Officers are responsible for training plans, for conducting unit training, and for supervising and testing individual training.

c. Throughout training, the application of prior instruction to current training must be emphasized.

d. A record of the training received by each individual should be kept on a progress card maintained by each chief of section for each man in his section. This card should show each period of instruction attended, tests taken, and progress made. Progress cards should be inspected frequently by the battery executive to make sure that they are being kept properly and to determine the state of training. *Requiring the chief of section to keep these records emphasizes his responsibility toward his section.*

e. The necessity for developing leadership and initiative in noncommissioned officers must be emphasized constantly throughout training.

Section II. MINIMUM TRAINING SCHEDULE

4. General

The training schedule outlined in paragraph 6 of this appendix is a guide to meet the minimum training requirements for personnel of a howitzer section in subjects covered in this manual.

5. Individual Periods

a. Individual periods of training in service of the piece should be arranged, along with other battery training, into a balanced training program taking into consideration the basic principles of training.

b. In general, except for service practice, periods on any subject should not be longer than 1 hour.

c. Howitzer drill periods should be preceded and followed by periods on subjects that will be logically related to the drill. For example, precede a period of howitzer drill with a period of testing and adjustment

of sighting and fire control equipment, and follow it with a period on inspection and maintenance drills.

d. Army Subject Schedule 6-3 provides uniform guidance in the conduct of cannoneer training.

e. TM 9-319 provides information on which to base periods of instruction on description, characteristics, and functioning of the howitzer, familiarization to include breech and firing mechanism, barrel assembly and slides, recoil mechanism, equilibrator, elevating mechanism, sighting and fire control equipment; and field assembly and malfunction. These should be included in the battery training schedule, closely allied with the training in service of the piece.

6. Schedule

Method	Hours	Subject	Text references	Training aids and equipment
C, D, PW	1.....	Organization and composition of gun section: general duties of individuals: formation of gun section.	Pars. 4-8, incl	Gun and prime mover.
C, D, PW	1.....	Posts and posting of cannoneers: changing posts; mounting and dismounting.	Pars. 9-13, incl	Do
C, D, PW	2..... (1 hour periods)	Coupling and uncoupling; prepare for action and march order; movement of gun by hand.	Pars. 14-19, incl	Do
C, D, PW	24..... (½ hour periods)	Gun drill, duties in firing, indirect laying.	Pars. 21-28, incl 41; 44-47 incl	TOE equipment.
C, D, PW	9..... (½ hour periods)	Gun drill duties in firing, direct laying.	Pars. 29-32, incl	Do

C, D, PW	6----- (1 hour and ½ hour periods)	Testing and adjustment of sighting and fire control equipment.	Pars. 48-58.	Do
C, D, PW	2----- (½ hour periods)	Aiming post displacement correc- tion.	Par. 42	TOE equipment, blackboard, and chalk.
C, D, PW	4----- (1 hour periods)	Inspections and maintenance drills	Pars. 59-69, incl	TOE equipment.
C, D, PW	1-----	Decontamination of materiel	Pars. 70-74, incl	Decontamination equipment; TOE equipment.
C, D, PW	1-----	Destruction of materiel to prevent use by the enemy.	Pars. 75-77, incl	Demolition and TOE equipment.
C, D-----	1-----	Safety precautions-----	Pars. 78-81, incl	TOE equipment.
PW-----	16----- (4 hour periods)	Service, practice, indirect laying	Pars. 21-28, incl 41: 43-47 incl	TOE equipment.

Method	Hours	Subject	Text references	Training aids and equipment
PW-----	4-----	Service, practice, direct laying-----	Pars. 29-32, incl	Do
C, PW-----	6----- (1 hour periods)	Review and tests of subjects previously covered.	All previous references.	Do

C—conference; D—demonstration; PW—practice work.

Section III. TESTS FOR QUALIFICATION OF GUNNERS

7. Purpose and Scope

This section prescribes the tests to be given in the qualification of gunners. The purpose of the test are twofold—

a. To provide a means of determining the relative proficiency of the individual artillery soldier in performing the duties of the gunner for the 75-mm pack howitzer M1A1. *The tests will not be a basis for determining the relative proficiency of batteries or higher units.*

b. To serve as an adjunct to training.

8. General Instructions

a. *Standards of Precision.* The candidate will be required to perform the tests in accordance with the standards listed below:

- (1) Scale settings must be exact and matching indexes must be brought into coincidence.
- (2) Level bubbles must be exactly centered.
- (3) The vertical reticle of the panoramic telescope must be alined on the left edge of the aiming post or on exactly the same part of the aiming point each time the piece is laid.
- (4) Final motions of azimuth and elevation setting knobs, as well as traversing handwheel and elevating crank, must be made in the appropriate direction. For elevating, the final motion of the crank should be in the direction of depression. Final motion for traversing is from left to right. Final movement of the vertical reticle of the telescope is from left to right.

b. Assistance. The candidate will receive no unauthorized assistance. Each candidate may select authorized assistants as indicated in the tests. In the event a candidate fails any test due to the fault of an assistant, the test will be disregarded, and the candidate will be given another test of the same nature.

c. Time. The time for any test will be the time from the last word of the command to the last word of the candidate's report. The candidate may begin any test after the first word of the first command.

d. Scoring. Scoring will be conducted in accordance with the subparagraphs *Penalties* and *Credit* under each subject. If a test is performed correctly, credit will be given in accordance with the subparagraph *Credit* under each subject. No credit will be allowed if conditions exist as specified in the subparagraphs headed *Penalties*.

e. Preparation for Tests. The howitzer will be prepared for action and the candidate posted at the proper position corresponding to the test being conducted or as indicated in the subparagraphs entitled "Special instructions." The examiner will insure that the candidate understands the requirements of each test and will require the candidate to report "I am ready" before each test.

f. Qualification Scores. Minimum scores required for qualification in the courses are as follows:

<i>Individual classification</i>	<i>Points</i>
Expert gunner.....	90
First-class gunner.....	80
Second-class gunner.....	70

9. Outline of Tests

Par. No.	Subject	No. of tests	Points each	Maximum credit
10	Direct laying-----	4	2	8
11	Indirect laying-----	18	2	36
12	Laying for elevation elevation scale-----	3	2	6
13	Laying for elevation gunner's quadrant-----	3	2	6
14	Displacement correction--	1	4	4
15	Measuring site to the mask-----	1	4	4
16	Measuring elevation-----	1	4	4
17	Measuring deflection-----	1	4	4
18	Tests and adjustments of sighting and fire control equipment-----	6	—	10
	Tests Nos. 2 and 6--	(2)	1	(2)
	Tests Nos. 1, 3, 4 and 5-----	(4)	2	(8)
19	Materiel-----	5	—	18
	Tests Nos. 1 through 4-----	(4)	4	(16)
	Test No. 5-----	(1)	2	(2)
Total Credit-----				100

10. Direct Laying

a. Scope of Tests. Four tests (two groups of two tests each) will be conducted in which the candidate will be required to execute commands similar to those given below. Tests Numbers 1 and 2 (and tests 3 and 4) will be executed as one series of commands.

b. Special Instructions.

- (1) A stationary target will be placed approximately 400 meters from the piece.

- (2) The piece will be pointed in the general direction of the target so the trail will not have to be shifted.
- (3) Laying at the termination of tests numbers 1 and 3 will not be disturbed at the beginning of tests numbers 2 and 4.
- (4) The examiner will announce the assumed direction of the movement of the target at the beginning of tests 1 and 3. The assumed direction of the movement of the target in test 3 will be opposite to that in test 1.

c. Outline of Tests.

Test No.	Examiner commands (for example)	Action of candidate
1 and 3	TARGET, THAT TANK; LEAD RIGHT 5, ELE- VATION 21.	Aligns the indexes (pan- oramic telescope) or the matching lines (Elbow telescope). Sets announced lead on the azimuth microm- eter scale. Sets announced eleva- tion. Elevates or depresses and traverses the piece until the cross- hairs are on the center of mass of the target. Centers cross-level bubbles. Calls "Fire" and steps clear.

Test No.	Examiner commands (for example)	Action of candidate
2 and 4	RIGHT (LEFT) 10, ADD (DROP) 5.	Same as test No. 1 above.

d. Penalties. No credit will be allowed if after each test—

- (1) The indexes are not in coincidence.
- (2) The lead is not properly set on the azimuth scale.
- (3) The correct elevation is not set on the elevation scale.
- (4) The telescope hairs are not placed on the center of the mass of the target.

e. Credit.

Time in seconds, exactly or less than-----	9	10	11
Credit-----	2.0	1.5	1.0

11. Indirect Laying

a. Scope of Tests. Eighteen tests (two groups of nine tests each) will be conducted in which the candidate will be required to execute commands similar to those given below. Tests Nos. 1 through 9 and tests Nos. 10-18) will be executed as one series of commands.

b. Special Instructions.

- (1) An assistant, selected by the candidate, will take the post of No. 5 cannoneer to shift the trail without command or as directed by the candidate.

- (2) The examiner will select a suitable aiming point and identify it to the candidate.
- (3) In each group of tests not more than four commands for deflection difference will be given.
- (4) The command for the deflection change for each test will be within the following prescribed limits:

Test No.	Maximum change (mils)	Minimum change (mils)
2 and 11	90	70
3 and 12	60	40
4 and 13	40	20
6 and 15	120	80
7 and 16	60	40
8 and 17	50	30
9 and 18	20	10

- (5) The piece will be laid with the correct settings at the conclusion of each test before proceeding with the next test.
- (6) Aiming posts will be set out at prescribed distances for these tests.
- (7) The examiner will designate the section number of the howitzer to be used. The examiner will announce deflection difference commands that will require the application of a deflection difference by the candidate.

c. Outline of Tests.

Test No.	Examiner commands (for example)	Action of candidate
1 and 10	AIMING POINT, CHURCH STEEPLE LEFT FRONT, DEFLECTION 2290, ON NO. 2 OPEN 6.	Sets deflection and applies deflection difference appropriate for his piece. Centers cross-level and longitudinal-level bubbles. Traverses piece until vertical hair is on aiming point. Verifies centering of bubble. Relays if necessary. Calls, "Ready" and steps clear.
2 and 11	DEFLECTION 2210.-----	Sets deflection change. Lays on aiming point. Checks centering; bubbles. Relays if necessary. Calls "Ready" and steps clear.
3 and 12	DEFLECTION 2260.-----	Same as Test No. 2 above.

Test No.	Examiner commands (for example)	Action of candidate
4 and 13	DEFLECTION 2230, ON NO. 4 CLOSE 3.	Same as test No. 2 above. Also applies deflection difference for his piece.
5 and 14	AIMING POINT, AIM- ING POST REFER, RECORD RE- FERRED DEFLEC- TION.	Refers telescope to aim- ing posts. Reads deflection and calls No. 1, deflection (). Records deflection on trail flask.
6 and 15	DEFLECTION 2310, ON NO. 4, OPEN 7.	Same as Test No. 4 above.
7 and 16	DEFLECTION 2282-----	Same as Test No. 2 above.
8 and 17	DEFLECTION 2301-----	Same as Test No. 2 above.
9 and 18	DEFLECTION 2216, ON NO. 2, CLOSE 4.	Same as Test No. 4 above.

d. Penalties. No credit will be allowed if, after each test—

- (1) The deflection is set incorrectly.
- (2) The vertical hair of the telescope is not on the aiming point after the cross-level and longitudinal-level bubbles are centered.

- (3) The last motion of traverse was not made to the right.

Note. If the assistant moves the trail other than as directed by the candidate which causes a deduction or loss of credit, the candidate will be given another test.

e. Credit.

Time in seconds, exactly or less than—

Tests Nos. 1 and 10, each.....	15	16½	18
Tests Nos. 5 and 14, each.....	8	9	14
Other tests, each.....	12	13	10
Credit.....	2.0	1.5	1.0

12. Laying for Elevation with the Elevation Scale

a. Scope of Tests. Three tests will be conducted in which the candidate will be required to execute commands similar to those given below.

b. Special Instructions.

- (1) Each test will require a change of settings and the accompanying laying of the tube in quadrant elevation within the limits of 20 to 40 mils.
- (2) Commands for elevation in tests Nos. 2 and 3 will not be made in multiples of 5 mils.

c. Outline of Tests.

Test No.	Examiner commands (for example)	Action of candidate
1	QUADRANT 280.....	Sets site at 300 and sets announced quadrant elevation.

Test No.	Examiner commands (for example)	Action of candidate
		Centers cross-level and longitudinal-level bubbles.
		Calls "Set" and steps clear.
2	QUADRANT 301-----	Same as Test No. 1 above.
3	QUADRANT 261-----	Same as Test No. 1 above.

d. Penalties. No credit will be allowed, if after each test—

- (1) The quadrant is set incorrectly.
- (2) The angle-of-site is not set at 300.
- (3) The cross-level or longitudinal-level bubble is not centered.

e. Credit.

Time in seconds, exactly or less than-----	8 $\frac{3}{4}$	9 $\frac{3}{4}$	10 $\frac{3}{4}$
Credit-----	2.0	1.5	1.0

13. Laying for Elevation with Gunner's Quadrant

a. Scope of Tests. Three tests will be conducted in which the candidate will be required to execute commands similar to those given below.

b. Special Instructions.

- (1) The gunner's quadrant will be set at zero for each test.

- (2) Each test will require a vertical movement of the tube of more than 29 and less than 61 mils.
- (3) The candidate will be posted to the right of and facing the breech with the gunner's quadrant in his hand.

c. Outline of Tests.

Test No.	Examiner commands (for example)	Action of candidate
1	QUADRANT 180-----	Sets quadrant elevation on the gunner's quadrant. Seats quadrant. Levels the quadrant bubble. Calls "Ready" and steps clear.
2	QUADRANT 240-----	Same as Test No. 1.
3	QUADRANT 207-----	Same as Test No. 1.

d. Penalties. No credit will be allowed, if after each test—

- (1) The quadrant is set incorrectly.
- (2) The quadrant is not properly seated.
- (3) The quadrant bubble is not properly centered.
- (4) The last movement of the tube was not made in the direction which caused the quadrant bubble to move from front to rear.

e. Credit.

Time in seconds, exactly or less than.....	8	9	10
Credit.....	2.0	1.5	1.0

14. Displacement Correction

a. Scope of Test. One test, consisting of two parts, will be conducted in which the candidate will be required to execute the commands given in *c* below.

b. Special Instructions.

- (1) Aiming posts will be set out at the prescribed distances.
- (2) An assistant, selected by the candidate, will be stationed close to the far aiming post.
- (3) The examiner will require the candidate to lay the piece on an announced deflection and report "I am ready."
- (4) The far post or the weapon will then be moved so that a displacement of 5 to 10 mils occurs.
- (5) The laying of the weapon at the termination of part I will not be disturbed for part II.

c. Outline of Tests.

(1) *Part I.*

Examiner commands	Action of candidate
CORRECT FOR DISPLACEMENT.	Lays the piece so that the far post appears midway between the near post and the vertical crosshair of the telescope. Checks centering of bubble.

Examiner commands	Action of candidate
	Re-lays if necessary.
	Calls "Ready" and steps clear.

(2) *Part II.*

Examiner commands	Action of candidate
ALINE AIMING POST-----	Records deflection on shield and announces "Deflection (so much) recorded."
	Directs assistant in alining aiming posts.
	Calls "Ready" and steps clear.

d. *Penalties.* No credit will be allowed if—

(1) *Part I.*

- (a) The far aiming post does not appear midway between the near post and the vertical crosshair of the telescope.
- (b) The cross-level or longitudinal-level bubble is not centered.
- (c) The last motion of traverse was not made to the right.

(2) *Part II.*

- (a) The deflection is other than the announced deflection.
- (b) The aiming posts are not properly alined.
- (c) The vertical hair of the telescope is not on the aiming posts.

e. Credit.

Part I, time in seconds, exactly or less than.	.3	3 $\frac{1}{3}$	3 $\frac{2}{3}$	4
Credit.....	3.0	2.0	1.5	1.0
Part II, no time limit				
Credit.....	1.0	—	—	—

15. Measuring Site to Mask

a. Scope of Test. One test will be conducted in which the candidate will be required to execute the command given in *c* below.

b. Special Instructions.

- (1) The piece prepared for action will be placed 200 to 400 meters from a mask of reasonable height.
- (2) The tube will be pointed so that it is 100 to 150 mils above the crest and 40 to 50 mils right or left of the highest point of the crest.
- (3) The candidate will take post at the right rear of the breach.

c. Outline of Test.

Examiner commands	Action of candidate
MEASURE SITE TO MASK.	Sights along lowest element of bore and operates elevating and traversing mechanism until line of sight just clears crest.

Examiner commands	Action of candidate
	Sets angle of site scale at 300, centers longitudinal-level bubble by turning elevating knob, and centers cross-level bubble.
	Reads elevation from elevation scale and micrometer.
	Reports "Number (), site to mask ()."

d. Penalties. No credit will be allowed if—

- (1) The line of sight along the lowest element of the bore does not just clear crest.
- (2) The cross-level or longitudinal-level bubble is not properly centered.
- (3) The angle of site scale does not read 300.
- (4) The site is announced incorrectly.
- (5) The last movement of the tube was not in the direction of depression.

e. Credit.

Time in seconds, exactly or less than-----	11	12	13	14
Credit-----	4.0	3.0	2.0	1.5

16. Measuring Elevation

a. Scope of Test. One test will be conducted in which the candidate will be required to measure the elevation by means of the gunner's quadrant.

b. Special Instructions. Prior to the test the examiner will lay the tube at a selected elevation, measure the elevation, and then set the gunner's quadrant at zero.

c. Outline of Test.

Examiner commands	Action of candidate
MEASURE AND ELEVATION.	Places gunner's quadrant on quadrant seats of the breech ring.
	Levels bubble by raising or lowering the index arm and turning the micrometer knob.
	Announces "Number (), Elevation ()," and hands quadrant to examiner.

d. Penalties. No credit will be allowed if—

- (1) The quadrant bubble is not centered when the quadrant is seated properly.
- (2) The elevation is announced incorrectly.

e. Credit.

Time in seconds exactly or less than.....	8	9½	10¾
Credit.....	4.0	3.0	2.0

17. Measuring Deflection

a. Scope of Test. One test will be conducted in which the candidate will be required to measure and report

a deflection in accordance with the command given below.

b. Special Instructions.

- (1) The piece will be laid on aiming posts to the left front.
- (2) An aiming point within 200 mils to the left or right of the aiming posts will be designated by the examiner and identified by the candidate.

c. Outline of Test.

Examiner commands	Action of candidate
NUMBER () AIMING POINT, THAT (), REFER.	Centers cross-level and longitudinal-level bubble. Refers to aiming point. Checks centering of bubbles and relays telescope if necessary. Reads deflection and reports, "Number () deflection ()" and steps clear.

d. Penalties. No credit will be allowed if—

- (1) The cross-level or longitudinal-level bubble is not centered properly.
- (2) The vertical hair of the telescope is not properly alined on the aiming point.
- (3) The deflection is announced incorrectly.
- (4) The traversing handwheel is turned.

e. Credit.

Time in seconds, exactly or less than.....	5	5¾	6	6¾
Credit.....	4.0	3.0	2.0	1.5

18. Test and Adjustment of Sighting and Fire Control Equipment

a. Scope of Tests. Six tests will be conducted in which the candidate will be required to demonstrate the methods employed in making the prescribed tests and authorized adjustments, or describe the action taken (e.g., send to the ordnance maintenance company) if adjustment is not authorized by using personnel.

b. Special Instructions.

- (1) The piece will be prepared for the tests as indicated in paragraphs 50 and 54.
- (2) The equipment which will be needed for the tests is listed in paragraph 49.
- (3) The candidate will select an assistant to aline the plumblines at the direction of the candidate during tests 3 and 6 and adjust and aline the testing target at the direction of the candidate prior to test 5.
- (4) This test will be conducted in the chronological sequence indicated in *c* below. After the completion of test No. 1, the gunner's quadrant used in that test will be used for accurately leveling the tube longitudinally and laterally, with the proper correction, as determined in Test Nos. 1 and 2, carried on the

quadrant provided that the correction does not exceed 0.4 mil.

- (5) Adjustments which the candidate may be required to accomplish will fall within the following limits:
- (a) Elevation and angle of site scales, not to exceed one 100-mil graduation.
 - (b) Elevation and angle of site micrometer scales, not to exceed ten 1 mil graduations.
 - (c) Rotating head and telescope mount elevation indexes, none.
 - (d) Rotating head and telescope mount elevation micrometer indexes, not to exceed one-fourth turn.
 - (e) Panoramic telescope azimuth scale, not to exceed one 100-mil graduation.
- (6) The tube will be leveled at the conclusion of test 2 and will not be disturbed thereafter.

c. Outline of Tests.

Test No.	Examiner commands	Action of candidate
1	PERFORM END-FOR-END TEST ON GUNNER'S QUADRANT.	Performs test as prescribed in par. 55. Calls "Error () mils, quadrant serviceable (unserviceable)" and hands quadrant to examiner for verification.

Test No.	Examiner commands	Action of candidate
2	PERFORM MICROMETER TEST ON GUNNER'S QUADRANT.	Performs test as prescribed in par. 55. Calls "Quadrant micrometer is (is not) in error."
3	TEST LEVEL BUBBLES.	Performs tests and makes adjustments, if necessary, as prescribed in par. 180d(2) of TM 9-319. Calls "Cross- (longitudinal-) level bubble(s) within (without) allowable limit."
4	TEST TELESCOPE MOUNT SCALES.	Performs tests as prescribed in par. 180d(3), TM 9-319. Calls "Ready" when test and adjustments are complete and steps clear.

Caution: Do not turn cross-leveling or longitudinal-leveling knobs after this test as the mount is now established in a horizontal plane.

Note. Prior to test 5, the cross-leveling and longitudinal-leveling of the tube and telescope mount will be verified by the examiner, and the testing target will be alined by the candidate with the help of his selected assistant as prescribed in TM 9-319.

Test No.	Examiner commands	Action of candidate
5	TEST TELESCOPE.....	Performs test as prescribed in pars. 50 and 51. Calls "Ready" when test and adjustments are complete and steps clear.
6	TEST AZIMUTH COMPENSATING MECHANISM.	Performs tests as prescribed in par. 180d (2)(b) 3, TM 9-319. Calls "Ready" when test is complete and steps clear.

Note. The tube must be level and the previously adjusted longitudinal-level bubble must be centered for test 6.

d. Penalties.

- (1) *General.* The tests are not essentially speed tests. The purpose of the prescribed time limits is to insure that the candidate can perform the operation without wasted time.
- (2) *Test No. 1.* No credit will be allowed if—
 - (a) The bubble of the gunner's quadrant does not center when verified by the examiner.
 - (b) The error (one-half of the amount of the angle which was indicated when the quadrant was first reversed and the bubble centered by moving the index arm and micrometer) is announced incorrectly by the candidate.
 - (c) The candidate fails to declare the quadrant

unservicable if the error (necessary correction) exceeds 0.4 mil, or fails to declare the quadrant servicable if the error (necessary correction) is less than 0.4 mil.

- (d) Time to complete test exceeds 2 minutes.
- (3) *Test No. 2.* No credit will be allowed if—
 - (a) The procedure is incorrectly followed.
 - (b) The time to complete the test exceeds 1 minute.
- (4) *Test No. 3.* No credit will be allowed if—
 - (a) The procedure is followed incorrectly.
 - (b) The candidate does not announce correctly in regard to the status of either the cross-level or longitudinal-level bubble.
 - (c) The time to complete test exceeds 6 minutes.
- (5) *Test No. 4.* No credit will be allowed if—
 - (a) The procedure is followed incorrectly.
 - (b) The time to complete the test exceeds 2 minutes.
- (6) *Test No. 5.* No credit will be allowed if—
 - (a) The candidate fails to make any adjustment when such adjustment is indicated.
 - (b) The rotating head elevation micrometer indexes are not in coincidence.
 - (c) The zero line of the azimuth scale micrometer is not in coincidence with its index.
 - (d) The centerline of the bore, viewed through the boresights, or the line of sight of the telescope do not follow their respective sighting points on the testing target when both micrometer scales are set at zero.
 - (e) The time to complete the tests and adjustments exceeds 4 minutes and 30 seconds.

(7) *Test No. 6.* No credit is allowed if—

- (a) The procedure is followed incorrectly.
- (b) The candidate fails to report the status of the azimuth compensating mechanism.
- (c) The time to complete the test and adjustment exceeds 1 minute.

e. Credit.

- (1) The candidate will be scored on the general merit of his work in addition to the specific requirements above.
- (2) If the tests and adjustments are performed correctly within the prescribed time limit, maximum credit will be given as follows:

Test No. 1.....	2
Test No. 2.....	1
Test No. 3.....	2
Test No. 4.....	2
Test No. 5.....	2
Test No. 6.....	1
Total.....	10

19. Materiel

a. Scope of Tests. Five tests will be conducted as outlined below which the candidate will be required to perform.

b. Special Instructions.

- (1) *Tests 1 and 2.* For tests 1 and 2, a paulin will be placed on the ground for the convenience of the candidate in laying out the disassembled parts. The candidate will be allowed to select the tools and accessories necessary for the performance of the tests prior to the start of the tests.

(2) *Test 3.*

- (a) A complete set of lubrication equipment authorized for use of battery personnel will be made conveniently available on a paulin adjacent to the howitzer.
- (b) Every type of lubricant used on the weapon will be placed conveniently on the paulin, in plainly labeled containers.

c. Outline of Test.

Test No.	Examiner commands	Action of candidate
1	DISASSEMBLE BREECH AND FIRING MECHANISMS.	Performs the operation as prescribed in TM 9-319, laying the parts on the paulin. After disassembly, identifies all parts to the examiner.
2	ASSEMBLE FIRING AND BREECH MECHANISMS.	Performs the operation as prescribed in TM 9-319.
3	DAILY, WEEKLY, AND MONTHLY LUBRICATION TEST.	Selects proper lubricating equipment and lubricant and shows <i>how</i> and with <i>which lubricant</i> each lubrication point is serviced. (Actual lubrication is not performed.)
4	NOMENCLATURE TEST.	Names and identifies major components of the howitzer, giving correct nomenclature.

Test No.	Examiner commands	Action of candidate
5	CHECK RECOIL.....	Explains how no reserve, full reserve, and excess reserve of oil is determined on the howitzer. Briefly explains procedure of establishing a full reserve in the system (TM 9-319).

d. Penalties.

- (1) The tests are not essentially speed tests. The purpose of the maximum time limits allowed is to insure that the candidate can perform the operation without wasted effort.

- (2) No credit will be given if the following time limits are exceeded:

Test No. 1.....	1½ minutes
Test No. 2.....	3 minutes
Test No. 3.....	2 minutes
Test No. 4.....	3 minutes
Test No. 5.....	3 minutes

- (3) A penalty of one-half point will be assessed for each component part not correctly identified or omitted in test 1. There is no time limit imposed on identification of component parts. However, the examiner may reduce the grade if it becomes obvious that the candidate is not familiar with the nomenclature.
- (4) A penalty of one-half point will be assessed for each lubrication point missed or lubricated

improperly, and for each time the proper lubricating device or proper lubricant is not selected.

- (5) A penalty of one-half point will be assessed for each major component not correctly identified or named.

e. Credit.

- (1) The candidate will be scored on the general merit of his work in addition to the specific requirements above.
- (2) If each test is performed correctly within the prescribed time limit, maximum credit will be given as follows:

Test No. 1.....	4
Test No. 2.....	4
Test No. 3.....	4
Test No. 4.....	4
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	—
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BY ORDER OF THE SECRETARY OF THE ARMY:

G. H. DECKER,
General, United States Army,
Chief of Staff.

Official:

J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

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NG: None.

USAR: Same as active Army except allowance is one copy to each unit.

For explanation of abbreviations used see AR 320-50.

Table I. Duties in Prepare for Action

Sequence	Chief of section	Gunner	Number 1	Number 2	Number 3	Number 4	Number 5
1	Supervises the work of all cannoneers during all sequences.	Removes holddown cable, unlocks elevating crank, and depresses howitzer slightly below zero elevation.	Pulls out top sleigh clamping latch pin and with socket of hand spike rotates the top sleigh clamping latch counter-clockwise $\frac{1}{4}$ turn.	Moves top sleigh to the rear, disengaging hooks, and removes top sleigh.	Removes covers and places to the left of the gun.	Removes hand spike from traveling position and places it by right wheel.	Places section chest to left of gun.
2			Assisted by numbers 2 and 3, removes tube and places at left front of the howitzer.	Assists number 1.	Assists number 1.		Removes breechblock, and places to right of gun.
3			Assisted by numbers 2, 3, and 4, removes bottom sleigh and cradle assembly and places at right front of howitzer.	Assists number 1.	Assists number 1.	Assists number 1.	
4		Disengages axle sleeve lock, and rotates axle sleeve $\frac{1}{4}$ turn. Pulls axle and wheels, assisted by numbers 4 and 5, from the traveling position and places in firing position. Rotates axle sleeve 90° and engages axle sleeve lock.	Supports front trail with the trunnion hook shaft.			Assists gunner with the left wheel.	Assists gunner with the right wheel.
5			Locks trunnion hooks after bottom sleigh and cradle are in position.	Assisted by numbers 3, 4, and 5, places bottom sleigh and cradle assemblies into the forward position.	Assists number 2.	Assists number 2.	Assists number 2.
6		Secures telescope mount support in sight bracket. Mounts telescope mount and telescope on the mount support after the top sleigh is replaced.	Places top sleigh in position after breechblock and tube assembly are in place.	Assisted by numbers 3, and 4, places tube assembly in the bottom sleigh after the breechblock is replaced.	Assists number 2.	Assists number 2.	Replaces breechblock.
7	Verifies that the recoil mechanism contains the proper amount of oil. Sets recoil indicator handle in the down position. Adjusts respirator.		Inserts top sleigh clamping latch pin after top sleigh clamping latch has been rotated.	Rotates top sleigh clamping latch clockwise $\frac{1}{4}$ turn.	Removes fuze setter from cover and sets time at safe.	Opens ammunition containers and takes out number of rounds designated by executive officer.	Opens ammunition containers.
8		Sets deflection zero, sets site 300, sets quadrant 300, centers the angle-of-site and cross-level bubbles. Tests and alines sighting equipment.	Operates breech mechanism, examines breechblock, chamber and bore, cleaning when necessary, leaving breech open.	Removes and assembles bore brush staff sections and places one foot to right of the right wheel, bore brush to the front. Distributes waste to cannoneers.	Arranges ammunition and equipment assisted by numbers 4 and 5.		Removes and assembles aiming posts and places them to the right front of the piece. Sets out aiming posts when directed by the chief of section.
9	Verifies gun is prepared for action. Reports to executive "Sir, number () in order," or reports any defects the section cannot remedy without delay.		Removes lanyard from chest and attaches it to the trigger knob immediately prior to firing.				

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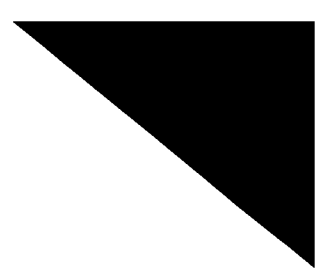


Table II. Duties in March Order

Sequence	Chief of section	Gunner	Number 1	Number 2	Number 3	Number 4	Number 5
1	Inspects the piece to insure it is not loaded. Supervises the work of all cannoneers during all sequences.	Traverses piece to center of axle. Depresses tube slightly below zero, and locks elevating cranks. Sets deflection zero, site 300, quadrant zero.	Closes breech, removes lanyard and places it in the chest.			Disassembles and secures bore brush staff inside rear trail.	
2	Sets recoil indicator handle in the up position.	Removes panoramic telescope mount support, mount and telescope and secures.	Pulls out top sleigh clamping latch pin and rotates the top sleigh clamping latch counterclockwise $\frac{1}{4}$ turn with the socket of the hand spike.	Moves top sleigh to the rear, disengaging hooks, and removes top sleigh.			
3			Assisted by numbers 2 and 3, removes tube.	Assists number 1.	Assists number 1.		Removes breechblock and places to right of gun.
4			Assisted by numbers 2, 3, and 4, removes bottom sleigh and cradle assemblies.	Assists number 1.	Assists number 1.	Assists number 1.	
5		Disengages axle sleeve lock, removes axle and wheels from firing position and places in traveling position. Engages axle sleeve lock.	Supports front trail with the trunnion hook shaft.			Assists gunner with left wheel.	Assists gunner with right wheel.
6				Assisted by numbers 3, 4, and 5, replaces bottom sleigh and cradle assemblies on the trail assembly.	Assists number 2.	Assists number 2.	Assists number 2.
7			Places top sleigh in position after tube and breechblock assembly are in place.	Assisted by numbers 3, and 4, replaces tube assembly in bottom sleigh after the breechblock is replaced.	Assists number 2. Prepares ammunition and equipment for loading in the prime mover.	Assists number 2.	Replaces breechblock.
8	When operations have been completed reports to the executive officer "Sir, No. () in order," or reports any defects the section cannot remedy without delay.	Assisted by number 1, replaces holddown cable.	Inserts top sleigh clamping latch pin after top sleigh clamping latch has been rotated. Replaces covers.	Rotates top sleigh clamping latch $\frac{1}{4}$ turn clockwise. Places hand spike in traveling position.			Retrieves and secures aiming posts. Assists numbers 3 and 4.

